VISIONIAS
www.visionias.in

Test Booklet Series

TEST BOOKLET

C

GENERAL STUDIES (P) 2022 – Test – 3492

Time Allowed: Two Hours **Maximum Marks: 200**

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS BOOKLET DOES **NOT** HAVE ANY UNPRINTED OR TURN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.

2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D** AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE ANSWER SHEET.

3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. **Do NOT** write anything else on the Test Booklet.

4. This Test Booklet contains **100** items (Questions). Each item is printed in **English.** Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response with you consider the best. In any case, choose **ONLY ONE** response for each item.

5. You have to mark all your responses ONLY on the separate Answer Sheet provided. See direction in the answers sheet.

6. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of **correct responses** marked by you in the answer sheet. For **every incorrect** response **1/3rd of the allotted marks** will be deducted.

7. Before you proceed to mark in the Answer sheet the response to various items in the Test booklet, you have to fill in some particulars in the answer sheets as per instruction sent to you with your Admission Certificate.

8. After you have completed filling in all responses on the answer sheet and the examination has concluded, you should hand over to Invigilator only the answer sheet. You are permitted to take away with you the Test Booklet.

9. Sheet for rough work are appended in the Test Booklet at the end.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ASKED TO DO SO

Join Telegram- https://t.me/upsc_success_time1

1. If someone in the family is suffering from a problem of acidity after overeating, which of the following would you suggest as a remedy?

(a) Lemon juice
(b) Vinegar
(c) Baking soda solution
(d) Both (a) and (b)

2. With reference to Dry Ice, consider the following statements:

1. It is the solid form of carbon dioxide.
2. It is used primarily as a cooling agent.
3. It has a lower temperature than that of water ice and does not leave any residue.

Which of the statements given above is/are correct?

(a) 2 and 3 only
(b) 1, 2 and 3
(c) 1 and 3 only
(d) 2 only

3. Which of the following is/are correct with reference to Adenosine triphosphate (ATP)?

1. It is produced during the process of cellular respiration.
2. It provides the energy needed to drive the endothermic reactions in the cell.

Select the correct answer using the code given below.

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

4. A person stands on loose sand and then lies down on it. He goes deeper into the sand while standing than while lying down. Which one of the following is the reason?

(a) The weight of the body is lesser while standing up.
(b) The density of the human body is lesser than sand
(c) The pressure on the sand is higher while standing up
(d) There is more friction between the body and the sand while lying down

5. With reference to the Indian National Satellite (INSAT) system, consider the following statements:

1. It is the communication satellite system of India under which satellites are placed in the Low Earth orbit.
2. It is used to provide services to telecommunications, weather forecasting, disaster warning and search and rescue operations.
3. HAMSAT, EDUSAT and KALPANA-1 are satellites launched under this system.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

6. Which of the following are used as biocommunicators among animal species?

1. Pheromones
2. Vocal Sounds
3. Body Language
4. Dancing

Select the correct answer using the code given below.

(a) 2 and 4 only
(b) 1, 2 and 3 only
(c) 1, 3 and 4 only
(d) 1, 2, 3 and 4

Join Telegram- https://t.me/upsc_success_time1

7. The color of the sun appears reddish during sunset. Which of the following is the reason behind this phenomenon?

(a) Absorption of light rays by the atmosphere

(b) Human eyes are not sensitive to other colors during that part of the day

(c) Scattering of light rays by atmospheric particles

(d) The sun emits different wavelengths of light during different times of the day

8. Which among the following best describe the significance of cell division/mitosis?

1. Healing of injuries
2. Growth of the body
3. Determination of sex of unborn foetus

Select the correct answer using the code given below.

(a) 1 and 3 only

(b) 2 and 3 only

(c) 1 and 2 only

(d) 1, 2 and 3

9. Recently, The Hubble Space Telescope observed 'Prawn Nebula'. In this context, which of the following best describes 'Prawn Nebula'?

(a) A dark star near the south celestial pole.

(b) A dwarf planet that orbits the sun.

(c) A massive stellar nursery located in the constellation.

(d) A spiral galaxy with a black hole.

10. Hyperspectral imaging is an imaging technique in which electromagnetic radiations of different frequencies can be captured. Which of the following is/are well-known applications of hyperspectral imaging?

1. Identification of tree species within a forest
2. Mineral exploration
3. Detection of bats by converting very high-frequency signals into low-frequency signals

Select the correct answer using the code given below.

(a) 1 and 2 only

(b) 2 only

(c) 1, 2 and 3

(d) 1 only

11. Which among the following are the uses of heavy water?

1. Preservation of Oral Polio Vaccines
2. Coolant in nuclear reactors
3. Bleaching agent

Select the correct answer using the code given below.

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

12. Consider the following pairs:

Space Launch		***Country***
1. Ziyuan-1 02E	:	China
2. Gaofen	:	France
3. Angara-A5	:	Russia

Which of the pairs given above are correctly matched?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

Join Telegram- https://t.me/upsc_success_time1

13. In the context of cosmology, which of the following statements is/are correct?

1. Only 10% of the matter in the universe is comprised of dark matter.
2. Black holes are formed as a result of a split in neutron stars.
3. Dark energy is evenly distributed throughout the universe in space and time.

Select the correct answer using the code given below.

(a) 3 only
(b) 2 and 3 only
(c) 1 and 2 only
(d) None

14. Which of the following best describes an Internet Cookie?

(a) It is a warning displayed on a webpage that cautions viewers against the contents of the webpage.
(b) It is any advertisement on a webpage that charges viewers when they click on it.
(c) It is a message given to a web browser intended to better guide the viewers through customisation of webpages.
(d) It is a highlighted text on a webpage which can lead viewers to another webpage when they click on it.

15. Consider the following statements with regard to the National Genomic Grid:

1. It is a pan India program to study genes of all patients suffering from all types of genetic diseases.
2. The study will utilize the technique of genome sequencing.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

16. Consider the following statements with respect to Like-Minded Developing Countries often seen in news:

1. It is a group of developing countries who organise themselves as a block of negotiators in international organizations.
2. They represent about 50% of the world's population.
3. Pakistan is not a part of this grouping.

Which of the statements given above is/are correct?

(a) 1, 2 and 3
(b) 2 and 3 only
(c) 1 and 2 only
(d) 1 only

17. Which of the following rays or radiations are used in thermal imaging?

(a) Gamma rays
(b) Infrared radiation
(c) X rays
(d) Ultraviolet radiation

18. Consider the following statements regarding virtual reality (VR) and augmented reality(AR) :

1. The real and virtual objects cannot be distinguished in VR whereas they can be distinguished in AR.
2. Both VR and AR can be viewed by users wearing special glasses only.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Join Telegram- https://t.me/upsc_success_time1

19. Which of the pairs given below is/are correctly matched?

Disease		*Cause*
1.Albinism	:	absence of melanin
2. Cri-du-chat syndrome	:	heavy metal poisoning
3. Cystic Fibrosis	:	mutation of gene

Select the correct answer using the code given below.

(a) 1 only
(b) 1 and 2 only
(c) 1 and 3 only
(d) 3 only

20. Colouring agents are used in crackers to give multiple colors to crackers when it bursts. In this context, consider the following pairs:

Elements/Salts		*Colour*
1. Strontium salts	:	Red
2. Copper salts	:	Orange
3. Sodium salts	:	Yellow
4. Calcium salts	:	White

Which of the pairs given above is/are correctly matched?

(a) 1 and 3 only
(b) 2 and 4 only
(c) 1 only
(d) 1, 2, 3 and 4

21. Nitrogen gas is used in the tyres of an airplane because

(a) Nitrogen gas is inert unlike air
(b) It is heavier than air
(c) It forms liquid only below a very low temperature
(d) Both (a) and (c)

22. Which of the following cell organelles play the most significant role in protein synthesis?

(a) Lysosome and Centrosome
(b) Endoplasmic reticulum and Ribosome
(c) Golgi apparatus and Mitochondria
(d) Lysosome and Mitochondria

23. Which of the following best describes reverse zoonotic event?

(a) A disease being transmitted from animals to humans
(b) It is a situation in which disease transmit from one animal species to other
(c) It is a situation where pathogens transmit from humans to animals.
(d) None of the above

24. Consider the following statements with reference to the WISER program:

1. The program aims at supporting girls in the age group 15-17 years in the financially vulnerable sections of society for interest and careers in science and technology.
2. It is launched by the Indo-German Science & Technology Centre (IGSTC), a joint initiative of the Government of India and Germany.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

25. Consider the following statements with reference to Arteries and Veins?

1. Arteries carry blood away from the heart and Veins bring it back to the heart.
2. Veins have thicker walls than arteries.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Join Telegram- https://t.me/upsc_success_time1

26. Recently, a series of law and order issues fuelled interstate disputes regarding the Belagavi border area. In this context, this border is shared by which of the following states?

(a) Gujarat and Maharashtra
(b) Andhra Pradesh and Telangana
(c) Maharashtra and Karnataka
(d) Andhra Pradesh and Karnataka

27. Which of the following bones are matched correctly with their respective body part?

Bone		***Body Part***
1. Femur	:	Thigh
2. Sternum	:	Skull
3. Patella	:	Shoulder

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 1 only
(c) 2 and 3 only
(d) 1, 2 and 3

28. Which of the following is/are the applications of recombinant DNA technology?

1. Synthesis of human insulin
2. Insect-resistant crops
3. Diagnostic tests for hepatitis and HIV
4. Environmental cleaning

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 1, 2 and 3 only
(d) 1, 2, 3 and 4

29. Oxidation is a process in which a chemical substance changes because of the addition of oxygen. Which of the following everyday process is/are result of oxidation?

1. Corrosion of iron
2. Rancidification of food
3. Combustion of hydrocarbons

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

30. The term 'Founder effect', in population genetics, is used to indicate

(a) reduced genetic variation as compared to the original population.
(b) increased genetic variation as compared to the original population.
(c) confinement of successive generations in the geographical area that is the original habitat of the founders.
(d) retreat of successive generations from the geographical area that is the original habitat of the founders.

31. Which of the following methods can be used for removing the permanent hardness of water?

1. Distillation
2. Adding sodium carbonate
3. Boiling
4. Adding caustic soda

Select the correct answer using the code given below.

(a) 1, 2 and 4 only
(b) 3 and 4 only
(c) 1, 2 and 3 only
(d) 1, 2, 3 and 4

Join Telegram- https://t.me/upsc_success_time1

32. From the point of view of evolution of living organisms, which one of the following is the correct sequence of evolution?

(a) Cat fish - Tortoise - Otter - Kiwi

(b) Cat fish - Kiwi - Tortoise - Otter

(c) Tortoise - Cat fish - Otter - Kiwi

(d) Cat fish - Tortoise - Kiwi - Otter

33. Which of the following technologies will be enabled by the 5G mobile communication networks?

1. Internet of Things
2. Edge Computing
3. Network Slicing

Select the correct answer using the code given below.

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

34. Consider the following statements regarding 'Halogens':

1. They are non-metallic elements that produce sodium salts of similar properties.
2. Because of their great reactivity, the free halogen elements are not found in nature.

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

35. Which of the following is/are Plant hormones?

1. Auxins
2. Gibberellins
3. Cytokinins

Select the correct answer using the code given below.

(a) 1 only

(b) 2 and 3 only

(c) 1, 2 and 3

(d) 2 only

36. With reference to Ransomware and Malware, consider the following statements:

1. While malware is a malicious code that disrupts a system by gaining unauthorized access, ransomware locks up the system files and demands a ransom to unlock the system.
2. While personal computers and laptops are affected by malware, ransomware only affects ATM machines.

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

37. Often seen in the news, Human Papillomavirus Vaccines (HPV) provide protection against which one of the following?

(a) Acquired Immunodeficiency Syndrome (AIDS)

(b) Cervical Cancer

(c) Chickenpox

(d) Measles and Rubella

Join Telegram- https://t.me/upsc_success_time1

38. Consider the following statements:

1. Both Graphene and Fullerene are allotropes of Carbon.
2. Fullerenes are excellent conductors of electricity whereas Graphenes exhibit poor conductivity.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

39. Recently, the Department of Telecommunications has rolled out fifth generation or 5G telecom services in 13 selected cities in India. In this context, consider the following statements:

1. Low band spectrum of 5G has better coverage and penetration of signals whereas the high band spectrum has more internet speed.
2. High band spectrum falls on the chart in the 24GHz and higher whereas the low band spectrum is lower than 1 GHz.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

40. Consider the following pairs:

Colors of Biotechnology		***Area of Biotech Activities***
1. Yellow	:	Medicine and Human Health
2. Brown	:	Arid Zone and Desert Biotechnology
3. Gold	:	Bioinformatics
4. Dark	:	Bioterrorism and Biowarfare

Which of the pairs given above are correctly matched?

(a) 1, 2 and 3 only
(b) 1 and 4 only
(c) 2, 3 and 4 only
(d) 1, 2, 3 and 4

41. With reference to biosimilar medicines, which of the following statements is ***not*** correct?

(a) They are products with similar molecular composition as the original biotherapeutic.
(b) They are derived from both biological and synthetic chemical sources.
(c) They are a cheaper alternative to costly life-saving medicines.
(d) Recently, the first ever biosimilar medicine was approved by the World Health Organization (WHO).

42. Consider the following statements:

1. A virus is a small parasite that cannot reproduce without a host.
2. It is difficult to kill a virus because they lack cellular structure.

Which of the statements given above is/are ***not*** correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

43. Consider the following statements regarding 'Teflon' :

1. It is chemically inert and resistant to attack by corrosive reagents.
2. It is used as a non-stick coating for cookware.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Join Telegram- https://t.me/upsc_success_time1

44. Semiconductors are present in most of the modern electronic devices that we use. Which of the following statements is/are true regarding semiconductors?

1. The resistivity of semiconductors is more than insulators but less than conductors.
2. The most commonly used semiconductor elements are Silicon and Germanium.

Select the correct answer using the codes given below.

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

45. Recently, astronomers from National Centre for Radio Astrophysics (NCRA) have discovered eight stars which belong to a rare class called Main-sequence Radio Pulse (MRPs) emitters. In this context, consider the following statements with reference to Main-sequence Radio Pulse emitters:

1. The MRPs are stars hotter than Sun with strong magnetic fields.
2. The pulsed radio emission from MRPs are the only visible signatures.
3. MRPs eject gases stronger than stellar winds.

Which of the statements given above is/are correct?

(a) 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

46. Which of the following statements are correct regarding ozone?

1. Ozone is a colorless and odorless gas.
2. It is formed from dioxygen by the action of ultraviolet light.
3. Ozone is used in disinfection.

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

47. A sound created in a big hall will persist by repeated reflection from the walls until it is reduced to a value where it is no longer audible. The repeated reflection that results in this persistence of sound is called as

(a) Diffusion
(b) Echo
(c) Diffraction
(d) Reverberation

48. With reference to White Blood Cells in the human body, consider the following statements:

1. White Blood Cells are white in color due to lack of hemoglobin.
2. White Blood cells are the first line of defense against pathogens.

Which of the statement given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Join Telegram- https://t.me/upsc_success_time1

49. With reference to the Bharat Gaurav scheme, consider the following statements:

1. Under the scheme, private players and tour operators can lease trains from Indian Railways to run on a theme-based circuit.
2. It offers operators the 'Right of Use' of rakes and infrastructure of Indian Railways.
3. The role of the Indian Railway Catering and Tourism Corporation (IRCTC) is restricted to deciding halts and tariffs in the journey.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

50. Which of the following are used as performance enhancing drugs and are also synthesised naturally in the body?

1. Erythropoietin (EPO)
2. Human growth hormone (hGH)
3. Testosterone
4. Insulin

Select the correct answer using the code given below.

(a) 1, 2 and 4 only
(b) 2 and 3 only
(c) 1 and 4 only
(d) 1, 2, 3 and 4

51. In the context of the process of respiration, consider the following statements:

1. Fishes derive oxygen by taking in water through their mouths and forcing it past the gills.
2. The rate of breathing in aquatic organisms is slower than that seen in terrestrial organisms.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

52. Consider the following statements with reference to Consumer Protection (Direct Selling) Rules, 2021:

1. The rules are notified by the Ministry of Consumer Affairs, Food & Public Distribution.
2. For ensuring compliance of these rules by direct sellers, every State Government is to set up a mechanism to monitor or supervise the activities of direct sellers.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

53. Which of the following best describes 'Kessler Syndrome', often seen in the news?

(a) A chain reaction in which more space objects will collide and create space junk
(b) A genetic disorder affecting girls and women due to completely or partially missing X chromosome
(c) A genetic condition that results when a boy is born with an extra copy of X chromosomes
(d) A type of motion sickness probably caused by an astronaut's inability to distinguish up from down while in orbit

54. Consider the following statements with reference to Prokaryotic and eukaryotic cells:

1. In Prokaryotic cells, there is a well-defined nucleus and membrane-bound organelles.
2. In Eukaryotic cells, there is no well-defined nucleus and organelles are absent.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Join Telegram- https://t.me/upsc_success_time1

55. Which of the following are the Purines nitrogen bases?

1. Adenine
2. Guanine
3. Cytosine
4. Uracil
5. Thymine

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 3 and 4 only
(c) 2, 4 and 5 only
(d) 1, 2 and 3 only

56. Indian Regional Navigation Satellite System (IRNSS) has recently been recognized by the International Maritime Organisation (IMO) as a part of the World Wide Radio Navigation System (WWRNS). In this context, consider the following statements regarding the Indian Regional Navigation Satellite System (IRNSS) :

1. The primary service area of IRNSS covers India as well as the region extending up to 1500 km from its boundary.
2. IRNSS provides services to both civilians as well as authorized users.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

57. With reference to different geoengineering technologies, consider the following statements:

1. Solar geoengineering is used to reflect sunlight back into space by using sulfates.
2. LOHAFEX is an ocean iron fertilization experiment to see if iron can cause algal bloom and trap carbon dioxide from the atmosphere.
3. SPICE is a project aimed to assess the feasibility of injecting particles into the stratosphere from a tethered balloon to manage solar radiation.

Which of the statements given above is/are correct?

(a) 2 only
(b) 1 and 2 only
(c) 1, 2 and 3
(d) 3 only

58. Thermoplastic polymers are linear or slightly branched long-chain molecules capable of repeatedly softening on heating and hardening on cooling. Which among the following is/are thermoplastic polymers?

1. Bakelite
2. Polythene
3. Polyvinyl chloride

Select the correct answer using the code given below.

(a) 1 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

59. Which of the following can induce mutations?

1. X rays
2. Gamma rays
3. Mustard gas
4. UV rays
5. Nitrous acid

Select the correct answer using the code given below.

(a) 1 and 4 only
(b) 2, 3 and 5 only
(c) 1, 3 and 4 only
(d) 1, 2, 3, 4 and 5

Join Telegram- https://t.me/upsc_success_time1

60. Pretomanid, bedaquiline and linezolid, recently seen in the news, are:

(a) chemicals used for cloud seeding.

(b) chemical pesticides.

(c) drugs used for the treatment of tuberculosis.

(d) Persistent Organic Pollutants (POPs) recently listed under the Stockholm Convention.

61. Which of the following are the constituents of a cell nucleus?

1. DNA
2. RNA
3. Protein

Select the correct answer using the code given below.

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

62. Which among the following can be the advantages of using the 'Embryo Transfer Technology' in animal husbandry?

1. It can be used to increase the number of offsprings.
2. It can be used to improve genetic structure of offsprings.
3. The offsprings born will be free from disease.

Select the correct answer using the code given below.

(a) 1 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

63. They are infectious agents that contain no RNA or DNA. They spread rapidly and even survive very high-temperature conditions. They are believed to be responsible for causing mad cow disease. They are

(a) Viroids

(b) Prions

(c) Viruses

(d) Bacteria

64. Which of the following are the potential applications of lasers?

1. It is used to measure the distance between two celestial bodies.
2. It provides information on continental drifting.
3. It detects and measures the pollutants in vehicular exhaust gases.
4. It is used in the barcode scanners.

Select the correct answer using the code given below.

(a) 1 and 2 only

(b) 3 and 4 only

(c) 2, 3 and 4 only

(d) 1, 2, 3 and 4

65. Recently, there is a crisis in the Sahel belt of Africa. The G5 Sahel Force was set up in 2017 for fighting the growing terrorist threat in the vast Sahel region. The Force is represented by which of the following countries?

(a) Morocco, Algeria, Libya, Egypt, Sudan.

(b) Namibia, Botswana, South Africa, Zimbabwe, Mozambique.

(c) Ethiopia, Kenya, Tanzania, Somalia, Eretria.

(d) Chad, Burkina Faso, Mali, Niger and Mauritania.

Join Telegram- https://t.me/upsc_success_time1

66. Which of the following statements is correct about the Starlink project?

(a) It is a satellite internet project to provide broadband internet coverage to people on ground.
(b) It is a project to send first "all civilian" crew to space.
(c) It is a laser technology project to prevent overcrowding of radio frequency spectrum.
(d) It is a project to find first galaxies or luminous objects formed after the Big Bang through James Webb Space Telescope.

67. 'Boson' has been quite frequent in news due to important scientific research. In this context, which of the following statements is/are correct about bosons?

1. They are elementary particles that make up the matter.
2. Electrons and Protons are included in the category of bosons.
3. Every boson has a negligible, but non zero mass.

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 3 only
(c) 1 and 3 only
(d) None

68. With respect to Free Space Optical (FSO) communication, which of the following statements is/are correct?

1. It is a communication technology in which data is transmitted through the air.
2. It can be used for point-to-point line of sight communication.

Select the correct answer using the code given below:

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

69. In the context of gravitational force and electromagnetic force, consider the following statements:

1. While gravitational force is always attractive, electromagnetic force can be both attractive and repulsive.
2. While gravitational force is only dependent on mass, the electromagnetic force is dependent on both mass and charge.
3. While gravitational force is dependent upon the distance between the two bodies, the electromagnetic force is independent of it.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

70. Consider the following statements with reference to Golden rice:

1. It is a genetically modified rice variety consumed to counter vitamin A deficiency.
2. Its production involves gene transfer from a bacterium.
3. Due to its unique characteristics, it cannot be bred with local varieties.

Which of the statements given above is/are correct?

(a) 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1 and 2 only

Join Telegram- https://t.me/upsc_success_time1

71. Which of the following are the constituents of nucleic acid?

1. Sugar
2. Phosphate
3. Nitrogenous base
4. Potassium base

Select the correct answer using the code given below.

(a) 1 and 4 only
(b) 2 and 3 only
(c) 1, 2 and 3 only
(d) 1, 2, 3 and 4

72. Which of the following pairs are correctly matched?

Acid		***Use***
1. Oxalic Acid	:	Bleaching of leather
2. Acetic Acid	:	Processing of foods
3. Citric Acid	:	Washing metals
4. Benzoic Acid	:	Accumulation batteries

Select the correct answer using the code given below.

(a) 1 and 3 only
(b) 2 and 4 only
(c) 2 and 3 only
(d) 1, 2 and 3 only

73. Which of the following is known as functional units of heredity?

(a) Genes
(b) Chromosomes
(c) Nucleus
(d) Ribosomes

74. A man with blood group A+ve marries a woman with O-ve. Which of the following blood groups is ***not*** possible for their children to have?

(a) A -ve
(b) O +ve
(c) AB +ve
(d) O -ve

75. Which of the following diseases is/are caused by protozoans?

1. Measles
2. Malaria
3. Diphtheria

Select the correct answer using the code given below.

(a) 1 only
(b) 2 only
(c) 1 and 3 only
(d) 2 and 3 only

76. Which among the following gases is/are used as chemical warfare agents?

1. Mustard gas
2. Sarin
3. Phosgene

Select the correct answer using the code given below.

(a) 1 only
(b) 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

77. With reference to the recently commissioned INS Vela, consider the following statements:

1. It is the fourth stealth Scorpene-class submarine under Project 75 in partnership with France.
2. It is a diesel-electric powered attack submarine with a silent Permanently Magnetised Propulsion Motor.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Join Telegram- https://t.me/upsc_success_time1

78. Recently, the Israeli government approved a plan to double the Jewish settler population in this area. The area is bounded by the Jordan River and Sea of Galilee on the west, Mount Hermon on the north, and Yarmouk River on the east and south. This area was part of Syria until 1967.

Which of the following areas is being described in the passage given above?

(a) Gaza Strip
(b) West Bank
(c) Golan Heights
(d) Sinai Peninsula

79. Which of the following is/are a chemical process?

1. Melting of an ice cube
2. Formation of vinegar from sugarcane juice
3. Mixing sugar in water

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 2 only
(d) 1, 2 and 3

80. Consider the following statements regarding 'Malleability':

1. It is the ability of a metal to be rolled into thin sheets without breaking.
2. Gold is a highly malleable metal.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

81. Which of the following enzymes of digestive system breaks down starch into sugar?

(a) Pepsin
(b) Protease
(c) Salivary amylase
(d) Lipase

82. 'Deep Web', is a term, often seen in the news. Which of the following statements best describes it?

(a) It refers to the bottom ten percent of the least visited websites.
(b) It refers to those parts of the World Wide Web whose contents are not indexed by standard web search engines.
(c) It collectively refers to the browsing and online tracking activities of all the intelligence agencies across the globe.
(d) It refers to those websites which covertly customise visitors priorities and requirements without displaying cookies.

83. With reference to the use of various medicines, consider the following pairs:

Category of Medicine		**Function**
1. Antihistamines	:	Anti fertility drug
2. Tranquilizers	:	Treatment of severe mental diseases
3. Analgesic	:	Reduces pain

Which of the pairs given above are correctly matched?

(a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

Join Telegram- https://t.me/upsc_success_time1

84. A cup with a hole in the bottom drains slower when filled with honey than when it is filled with water. This is because of

(a) presence of impurities in the water.
(b) the higher gravitational pull on water.
(c) the difference in viscosities of honey and water.
(d) stronger capillary effect in case of honey.

85. Which among the following is/are disorders of the circulatory system?

1. High blood pressure
2. Parkinson's disease
3. Epilepsy

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

86. Which of the following parts of the brain is responsible for controlling body temperature and the release of hormones by the pituitary gland?

(a) Frontal Lobe
(b) Hypothalamus
(c) Medulla Oblongata
(d) Cerebellum

87. Which of the following correctly describes the 'prebiotics'?

(a) Food ingredients that encourage the growth of beneficial gut bacteria.
(b) A type of antimicrobial drug used in the treatment and prevention of bacterial infections.
(c) Preservatives added to food products to prevent decomposition by microbial growth.
(d) Vaccine used to stimulate the production of antibodies and provide immunity against one or several diseases.

88. Isotopes have the same atomic number but different atomic masses. Which among the following are the uses of radioactive isotopes?

1. Treatment of cancer
2. Fuel in nuclear reactors
3. Treatment of goitre

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3

89. In the context of the effects of radioactive radiation on living beings, consider the following statements:

1. Alpha particles (α) are small, fast-moving particles with a negative electrical charge that are emitted from an atom's nucleus during radioactive decay.
2. Beta particles (β) are positively charged lacking the energy to penetrate the skin.
3. Gamma rays (γ) are weightless packets of energy that can cause damage to the cell structure.

Which of the statements given above is/are correct?

(a) 3 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) None

90. Which of the following organs help in eliminating excretory elements in the human body?

1. Kidneys
2. Lungs
3. Liver
4. Skin

Select the correct answer using the code given below.

(a) 1, 2 and 4 only
(b) 1, 2 and 3 only
(c) 3 and 4 only
(d) 1, 2, 3 and 4

Join Telegram- https://t.me/upsc_success_time1

91. Which of the following parts of circulatory system carry the oxygenated blood?

1. Pulmonary artery
2. Left Ventricle
3. Pulmonary Vein

Select the correct answer using the code given below.

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

92. Which of the following can be used as an acid-base indicator?

1. Red cabbage leaves
2. Onion
3. Phenolphthalein

Select the correct answer using the code given below.

(a) 1 and 3 only
(b) 2 and 3 only
(c) 1 and 2 only
(d) 1, 2 and 3

93. Double Fortified Salt is one of the most cost-effective opportunities to deliver critical micronutrients. Which among the following micronutrients are fortified to table salt?

1. Iodine
2. Iron
3. Chromium

Select the correct answer using the code given below.

(a) 1 only
(b) 1 and 2 only
(c) 1 and 3 only
(d) 2 and 3 only

94. The term *Epigenetics* is commonly seen in the news. Which of the following statements best describes this term?

(a) It is the study of evolution of human genetics in comparison to other living objects.
(b) It is the study of behavioural changes in gene expression that occur owing to changes in the DNA sequence.
(c) It is the study of rare diseases which are caused by genetic disorders.
(d) It is the study of heritable changes in gene expression that do not involve changes to the underlying DNA sequence.

95. With reference to stem cells, consider the following statements.

1. They develop into different types of specialized cells in the human body.
2. They are only found inside an embryo.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

96. Consider the following statements regarding Magnetic Resonance Imaging (MRI):

1. MRI scanning uses X rays in the magnetic field to produce images of body parts.
2. While MRI scanning cannot produce the pictures of bone, Computerized Tomography (CT scan) can produce pictures of bone.
3. Jewelry and other wearable metallic accessories are not allowed during MRI since it interferes with the magnetic field.

Which of the statements given above is/are correct?

(a) 3 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1 and 3 only

Join Telegram- https://t.me/upsc_success_time1

97. What is White-fi communication technology?

(a) It refers to use of visible light portion of electromagnetic spectrum for communication.

(b) It refers to the use of unused or underused portion of broadband frequencies for communication.

(c) It refers to the advancement in wi-fi technology that completely removes white noise.

(d) It is a solar-powered broadband wireless technology.

98. 'Totipotency' is best described as the ability of a

(a) single cell to divide and produce all of the differentiated cells in an organism.

(b) virus to replicate inside the body of its host.

(c) dying cell to regain life by slowing down the process of oxidation.

(d) new organism to develop from an outgrowth or bud due to cell division at one particular site.

99. With reference to Washing Soda, consider the following statements:

1. Sodium chloride is used in the manufacturing of Washing Soda.
2. It is used as a cleaning agent for domestic purposes.
3. It is used for removing the permanent hardness of the water.

Which of the statements given above is/are correct?

(a) 1 only

(b) 1 and 2 only

(c) 2 and 3 only

(d) 1, 2 and 3

100. With reference to the nanomaterials, consider the following statements:

1. An object to be classified as nanomaterial should have all the three-dimension in the nanometer scale (1-10 nm).
2. Nanomaterials can only be synthesized artificially.

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 only

(c) Both 1 and 2

(d) Neither 1 nor 2

Copyright © by Vision IAS
All rights are reserved. No part of this document may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission of Vision IAS.

Join Telegram- https://t.me/upsc_success_time1

Join Telegram- https://t.me/upsc_success_time1

Join Telegram- https://t.me/upsc_success_time1

ANSWERS & EXPLANATIONS
GENERAL STUDIES (P) TEST – 3492 (2022)

Q 1.C

- Acid and bases neutralize each other. So, if someone is suffering from acidity, he or she needs to be treated with a basic solution. Lemon and vinegar are acidic in nature whereas baking soda is basic in nature.
- Lemon contains citric acid and vinegar contains acetic acid, both of which are acidic in nature whereas baking soda is basic in nature.
- **Hence option (c) is the correct answer.**

Q 2.B

- Dry ice, sometimes referred to as "**Cardice**" or as "**card ice**" is the solid form of **carbon dioxide**.
- It is used primarily as a **cooling agent**.
- Its advantages i**nclude lower temperature than that of water ice and not leaving any residue** (other than incidental frost from moisture in the atmosphere).
- It is useful for preserving frozen foods, ice cream, etc., where mechanical cooling is unavailable.

Q 3.C

- Adenosine triphosphate (ATP) is the energy currency for most cellular processes. **The energy released during the process of cellular respiration is used to make an ATP molecule from ADP and inorganic phosphate**.
- **Endothermic processes (processes that consume energy) in the cell then use this ATP to drive the reactions**. When the terminal phosphate linkage in ATP is broken using water, the energy equivalent to 30.5 kJ/mol is released.
- **Hence, both the statements are correct**.

Q 4.C

- The effects of forces of the same magnitude on different areas are different. When the person stands on loose sand, the force, that is, the weight of his body is acting on an area equal to the area of his feet. When he lies down, the same force acts on an area equal to the contact area of his whole body, which is larger than the area of his feet. In both cases, the force exerted on the sand is the weight of his body and the force is acting perpendicular to the surface of the sand. The force acting on an object perpendicular to the surface is called thrust. The effect of thrust on sand is larger while standing than while lying. The thrust on the unit area is called pressure.
- Pressure = Thrust/Area
- **Thus, higher pressure is exerted by the body on the sand while standing and the person goes down deeper into it as compared to when he is lying down.**

Q 5.B

- **Statement 1 is not correct:** The Indian National Satellite (INSAT) system is one of the largest **domestic communication satellite systems in Asia-Pacific region with most of the operational communication satellites placed in Geo-stationary orbit/Geosynchronous Transfer Orbit.** Established in 1983 with commissioning of INSAT-1B, the latest satellite in this constellation was launched in January 2020 called the GSAT-30 in the Geosynchronous Transfer Orbit (GTO) from Kourou launch base, French Guiana by Ariane-5 VA-251.
- **Statement 2 is correct:** The INSAT system with more than 200 transponders in the C, Extended C and Ku-bands provides services to **telecommunications, television broadcasting, satellite newsgathering,**

Join Telegram- https://t.me/upsc_success_time1

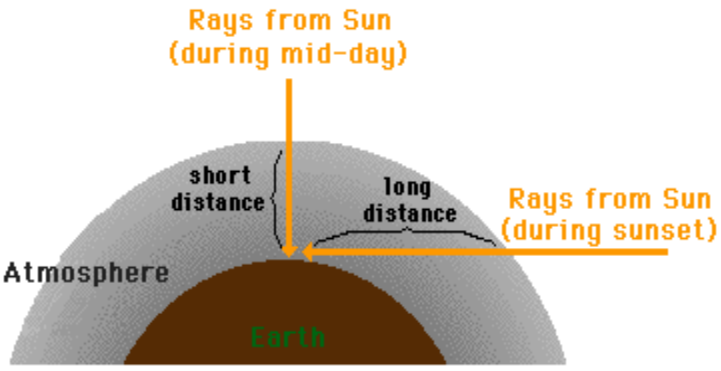
societal applications, weather forecasting, disaster warning and Search and Rescue operations. GSAT-19 and GSAT-29 in the series were launched by GSLV-Mk III, which is three-stage vehicle with two solid motor strap-ons, a liquid propellant core stage and a cryogenic stage. It is capable of launching 4 ton class of satellite to Geosynchronous Transfer orbit (GTO).

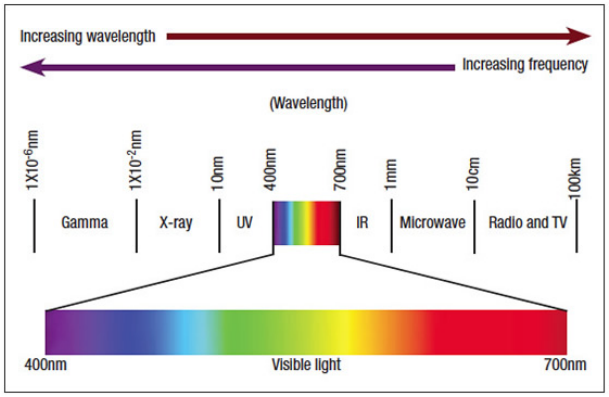
- **Statement 3 is correct:** HAMSAT is a Micro-satellite for providing satellite based Amateur Radio services to the national as well as the international community of Amateur Radio Operators (HAM). METSAT (renamed as Kalpana - 1 on February 5, 2003 after the Indian born American Astronaut Dr. Kalpana Chawla, who died on February 1, 2003 in the US Space Shuttle Columbia disaster) is the first in the series of exclusive meteorological satellites built by ISRO. GSAT-3, known as EDUSAT is meant for distant class room education from school level to higher education. This was the first dedicated "Educational Satellite" that provide the country with satellite based two way communication to class room for delivering educational materials.
- Indian Space Research Organisation has launched a special programme for School Children called "Young Scientist Programme" "YUva VIgyani KAryakram" (युविका) from the year 2019.The Program is primarily aimed at imparting basic knowledge on Space Technology, Space Science and Space Applications to the younger ones with the intent of arousing their interest in the emerging areas of Space activities

Q 6.D

- **Most animals use "body language"** as well as sound and smell in order to communicate with one another. **Chimpanzees greet each other by touching hands.** Male fiddler crabs wave their giant claw to attract female fiddler crabs. White-tailed deer show alarm by flicking up their tails.
- Many animals communicate by smell: they release **pheromones (airborne chemicals)** to send messages to others. Pheromones play an important part in reproduction and other social behavior. They are used by many animals, including insects, wolves, deer etc.
- **Bees dance when they have found nectar**. The scout bee will dance in the hive, and the dance directs other bees to the location of the nectar.
- **Animals use sound to warn others** to stay out of its territory and also to attract a mate. They **make** at least twenty five **different sounds** which include growling, squawking, squealing, cooing, and rattling.
- **Hence option (d) is the correct answer.**

Q 7.C





- **As sunlight travels through the earth's atmosphere, it gets *scattered* (changes its direction) by the atmospheric particles.** Light of shorter wavelengths is scattered much more than light of longer wavelengths. (The amount of scattering is inversely proportional to the fourth power of the wavelength. This is known as Rayleigh scattering). At sunset or sunrise, the sun's rays have to pass through a larger distance in the atmosphere. Most of the blue and other shorter wavelengths are removed by scattering. The least scattered light reaching our eyes, therefore, the sun looks reddish. This explains the reddish appearance of the sun and full moon near the horizon.
- This is also the reason that the sky appears blue during the day, as blue has a shorter wavelength than red and is scattered much more strongly. In fact, violet gets scattered even more than blue, having a shorter wavelength. But since our eyes are more sensitive to blue than violet, we see the sky blue.
- **Hence option (c) is the correct answer.**

Join Telegram- https://t.me/upsc_success_time1

- **The significance of mitosis in the living world is:**
  - Growth of the body: Growth of the body of a living being takes place by mitotic division. A unicellular zygote is transformed to a human body. **Hence, statement 2 is correct.**
  - Maintaining equality of chromosome number: By this division the number and properties of a chromosome in each cell of a multicellular body remains constant.
  - Keeping the size and shape constant: By this division the definite shape and size of the cell remains constant.
  - Healing of injuries: By producing new cells this process repairs the various types of damage of multicellular organisms. **Hence, statement 1 is correct.**
  - Formation of sex organs: By this process sex organs are formed. As a result, continuity of reproductive sequence is maintained.
- Every living being has a definite number of chromosomes. In human beings there are 23 pairs of chromosome. Among them 22 pairs are similar in both male and female, these are Autosomes, AA. Members of the remaining pair of chromosome are different in male and female. This pair of chromosome determines the sex of human beings. **Hence, statement 3 is not correct.**

Q 9.C

- **The Hubble Telescope has observed the Prawn Nebula, which is a massive stellar nursery located in the constellation Scorpius, about 6,000 light-years from Earth. Hence option (c) is the correct answer.**
- Though the nebula stretches 250 light-years and covers a space four times the size of the full moon, it emits light primarily in wavelengths the human eye cannot detect, **making it extremely faint to earthbound viewers.**
- The Prawn Nebula, also known as IC 4628, is an emission nebula, which means its gas has been energized, or ionized, by the radiation of nearby stars. **The radiation from these massive stars strips electrons from the nebula's hydrogen atoms.**
- As the energized electrons revert from their higher-energy state to a lower-energy state by recombining with hydrogen nuclei, they emit energy in the form of light, causing the nebula's gas to glow.
- **The Hubble Space Telescope image was captured as part of a survey of massive- and intermediate-size "protostars," or newly forming stars.**

Q 10.A

- **Multispectral imagery** is produced b**y sensors that measure reflected energy** within several specific sections (also called **bands) of the electromagnetic spectrum.** Multispectral sensors usually have between **3 and 10 different band measurements** in each pixel of the images they produce. Examples of bands in these sensors typically include visible green, visible red, near-infrared, etc. Landsat, Quickbird, and Spot satellites are well-known satellite sensors that use multispectral sensors.
- Hyperspectral sensors measure energy in narrower and more numerous bands than multispectral sensors. Hyperspectral images can contain as many as 200 (or more), contiguous spectral bands. The numerous narrow bands of hyperspectral sensors provide a continuous spectral measurement across the entire electromagnetic spectrum and therefore are more sensitive to subtle variations in reflected energy. Images produced from hyperspectral sensors contain much more data than images from multispectral sensors and have a greater potential to detect differences among land and water features.
- Hyperspectral imaging has been widely used in mineral exploration and mapping, vegetation classification (identification of trees in forests) and environment analysis, etc. **Hence options 1 and 2 are correct.**
- Bat detectors use sound frequency converters to convert the ultrasound frequencies into audible frequencies. They do not use hyperspectral imaging. **Hence option 3 is not correct.**

Q 11.A

- A pressurized heavy-water reactor (PHWR) is a nuclear reactor, commonly using unenriched natural uranium as its fuel, that uses heavy water (deuterium oxide D2O) as its coolant and neutron moderator.
- Non-Nuclear Applications of heavy water include: **Preservation of Oral Polio Vaccines, Deuterated drugs for enhancement of biological efficacy, Deuterated optical fibers to enhance transmission efficiency etc.**
- Heavy water is not used as a bleaching agent. Hydrogen peroxide is the simplest peroxide and is used as an oxidizer, bleaching agent and antiseptic.

Join Telegram- https://t.me/upsc_success_time1

Q 12.C

- **A new Chinese Earth observation satellite named "Ziyuan-1 02E" was launched into space by China. Hence pair 1 is correctly matched.**
- The satellite, called Ziyuan-1 02E, has been equipped with a high-resolution infrared camera, a long-wavelength infrared camera and a multi-spectrum imager.
- The satellite is designed for an eight-year lifespan in Earth orbit. It was launched with the objective of mapping the Earth's surface in high resolution to explore the natural resources. Data from satellites will be used to alert for environmental disasters and monitor water quality.
- **China** boosts Earth-observation abilities with **2 Gaofen satellites**. **Hence pair 2 is not correctly matched.** The two new satellites launched on separate rockets and from different space centres, but they share a name, Gaofen ("high resolution"). While both will observe the Earth, each will have different roles and users.
- **Recently, The third test flight of the Angara A5 rocket took off from Plesetsk Cosmodrome in northwestern Russia. Hence pair 3 is correctly matched.** The launcher reached low Earth orbit but was unable to go higher as planned due to an engine failure in its upper-stage Persei booster.

Q 13.A

- **The visible universe**—including Earth, the sun, other stars, and galaxies—is made of protons, neutrons, and electrons bundled together into atoms. They **make up only 5% of the universe.**
- Galaxies in our universe seem to be achieving an impossible feat. They are rotating with such speed that the gravity generated by their observable matter could not possibly hold them together; they should have torn themselves apart long ago. Scientists theorise that something we have yet to detect directly is giving these galaxies extra mass, generating the extra gravity they need to stay intact.
- This strange and unknown matter was called "dark matter" since it is not visible. **Dark matter** outweighs visible matter roughly six to one, **making up about 27% of the universe. Hence statement 1 is not correct.**
- **Dark energy makes up the remaining 68% of the universe** and appears to be associated with the vacuum in space. It is distributed evenly throughout the universe, not only in space but also in time – in other words, its effect is not diluted as the universe expands. **Hence statement 3 is correct.**
- **A neutron star is the collapsed core of a giant star.** Neutron stars have a radius on the order of 10 kilometers and a mass of about 1.4 solar masses. Hence it has an enormous density. **They result from the supernova explosion of massive stars.**
- When the supernova results in a neutron star core, the electrons, and protons in the core are merged to become neutrons, so the newly born 20-km-diameter neutron star containing between 1.4 and 3 solar masses is like a giant atomic nucleus containing only neutrons.
- If the neutron star's mass is then increased, neutrons become degenerate, breaking up into their constituent quarks, thus the star becomes a quark star; **a further increase in mass results in a black hole.** Hence black holes result from massive neutron stars. Neutron stars' split does not result in black holes. **Hence statement 2 is not correct.**

Q 14.C

- **A cookie (called an Internet or Web cookie) is the term given to describe a type of message that is given to a web browser by a web server. The main purpose of a cookie is to identify users and possibly prepare customized Web pages or to save site login information for you.**
- When you enter a website using cookies, you may be asked to fill out a form providing personal information; like your name, email address, and interests. This information is packaged into a cookie and sent to your Web browser, which then stores the information for later use. The next time you go to the same Web site, your browser will send the cookie to the Web server. The message is sent back to the server each time the browser requests a page from the server.
- A web server has no memory so the hosted website you are visiting transfers a cookie file of the browser on your computer's hard disk so that the site can remember who you are and your preferences. This message exchange allows the Web server to use this information to present you with customized Web pages. So, for example, instead of seeing just a generic welcome page you might see a welcome page with your name on it.
- **Hence option (c) is the correct answer.**

Q 15.B

- Recently, the government has announced to set up a **National Genomic Grid (NGG), which will study genomic data of cancer patients from India. Hence statement 1 is not correct.**

Join Telegram- https://t.me/upsc_success_time1

- The grid to be formed will be in line with the National Cancer Tissue Biobank (NCTB) set up at the Indian Institute of Technology, Madras and will collect samples from cancer patients, through a network of pan-India collection centers.
- The grid will have four parts, with the country divided into east, west, north, and south
- **The aim is to study genomic factors influencing cancer and identifying the right treatment modalities for the Indian population.**
- The genomic samples will help researchers to have India-specific studies on cancers.
- **This study is carried out through the technique of Genome Sequencing** that is the process of determining the complete DNA sequence of an organism's genome at a single time. **Hence statement 2 is correct.**

Q 16.C

- **Recently, most of the developing nations like China, India and African countries, have asked around the US $1.3 trillion per year from wealthy countries in climate finance which will start from 2030.**
- These countries are pushing for the inclusion of proposals in the final decisions which will be agreed upon at the climate conference in Glasgow.
- **Like Minded-Group of Developing Countries (LMDC) is a group of developing countries, organised as block negotiators in international organizations like the United Nations and the World Trade Organization. Hence statement 1 is correct.**
- **LMDC represent about 50% of the world's population. Hence statement 2 is correct.**
- Member countries of the Like-Minded Group include Bangladesh, Algeria, Bhutan, Belarus, Cuba, China, India, Egypt, Iran, Indonesia, Malaysia, Nepal, Myanmar, Sri Lanka, **Pakistan**, the Philippines, Syria, Sudan, Vietnam, and Zimbabwe. **Hence statement 3 is not correct.**

Q 17.B

- All objects emit **infrared energy** (heat).
- In general, the hotter an object is, the more radiation it emits.
- A thermal imager (also known as a thermal camera) is essentially a heat sensor that is capable of detecting tiny differences in temperature.
- The device collects the infrared radiation from objects in the scene and creates an electronic image based on information about the temperature differences.
- Because objects are rarely precisely the same temperature as other objects around them, a thermal camera can detect them and they will appear as distinct in a thermal image.
- Thermal images are normally grayscale in nature: black objects are cold, white objects are hot and the depth of gray indicates variations between the two.
- Some thermal cameras, however, add color to images to help users identify objects at different temperatures.
- They can be used to search for victims outdoors on a cool night, spot smoldering fires inside a wall, or detect overheating electrical wiring

Q 18.A

- Augmented Reality blends virtual reality and real life, but users continue to be in touch with the real world while interacting with virtual objects around them, so they can distinguish between the two.
- Virtual Reality creates an entirely fabricated world, that users would find it difficult to tell the difference between what is real and what is not. **Hence, statement 1 is correct.**
- VR is usually possible by wearing a VR helmet or goggles while AR does not require users to wear special glasses. **Hence, statement 2 is not correct.**

Q 19.C

- **Albinism**: Albinism is an autosomal recessive mutation. An albino cannot synthesize melanin which provides black coloration to skin and hair. Albinism is due to tyrosinase deficiency. The enzyme tyrosinase normally converts the amino acid tyrosine to melanin through an intermediate product DOPA (dihydro phenylalanine). **Hence pair 1 is correctly matched.**
- **Cri-du-chat (cat's cry) syndrome:** also known as 5p- (5p minus) syndrome, is a chromosomal condition that results when a piece of chromosome 5 is missing. Infants with this condition often have a high-pitched cry that sounds like that of a cat. The disorder is characterized by intellectual disability and delayed development, small head size (microcephaly), low birth weight, and weak muscle tone (hypotonia) in infancy. **Hence pair 2 is not correctly matched.**

Join Telegram- https://t.me/upsc_success_time1

- **Cystic fibrosis:** The most common lethal genetic disease due to a recessive mutation on chromosome-7. The body produces abnormal glycoprotein which interferes with salt metabolism. The mucus secreted by the body becomes abnormally viscid and blocks passages in the lungs, liver, and pancreas. **Hence pair 3 is correctly matched.**

Q 20.A

- Composition of Regular Crackers – A traditional firecracker comprises of six key elements:
- **Fuel**: Mainly Charcoal or Thermite are present in them all
- **Oxidising Agents:** Nitrates and Chlorates which produce oxygen inside the cracker
- **Reducing Agents:** Something like sulphur, which can burn the oxygen present in the firecracker
- **Regulators:** To ensure the speed and intensity with which a cracker bursts
- **Coloring Agents:** Multiple colours appear when a cracker bursts, this role is played by the colouring agents. Given below are the elements which provide different colours:
- **Strontium salts – Red Colour, hence pair 1 is correctly matched.**
- Burning of metals – White Colour
- **Sodium salts – Yellow Colour, hence pair 3 is correctly matched.**
- Barium salts – Green Colour
- **Calcium Salts – Orange Colour, hence pair 4 is not correctly matched.**
- **Copper Salts – Blue Colour, hence pair 2 is not correctly matched.**
- Binders: All the components of the firecracker require a medium which can bind them

Q 21.D

- **Aircraft tires are filled with nitrogen because nitrogen gas is mostly inert, meaning that it requires more energy to react with other substances.** This is important because, at elevated temperatures, oxygen can react with rubber. Oxidized rubber is weaker than non-oxidized rubber, and weaker tires are not preferred.
- **Air has certain moisture content and it is generally very hard to remove this moisture**. If an airplane tires were filled with air, at the flight altitude ice would form inside the tires since the temperature up there is about -30 degrees F. Landing with a chunk of ice in the tire would make it out of balance and change the tire pressure. Tires would probably burst.
- **On the other hand, nitrogen doesn't form a liquid till -173C and pure nitrogen has almost no moisture.**
- **Nitrogen being lighter than air does not play a part in it being used in the airplane tyres.**
- **Hence option (d) is the correct answer.**

Q 22.B

- **Endoplasmic reticulum and Ribosomes.**
- Ribosomes are the factories of protein synthesis. They are 70S type in prokaryotes and 80S type in Eukaryotes. When Ribosomes are attached to Endoplasmic reticulum (ER), it is called Rough ER which helps in protein synthesis.
- **Hence option (b) is the correct answer.**

Q 23.C

- Zoonosis, the transmission of an infectious disease from animals to humans, represents a major public health issue. This is particularly highlighted by the recent coronavirus disease 19 (COVID-19) pandemic and the Ebola virus disease outbreak across Western Africa in 2014 – 2016, both of which are suspected to have originated in animals.
- **Reverse zoonosis, in which a disease transmits from humans to animals, also poses threats to animal health as well as public health, due to the potential for animal disease reservoirs to form.**
- A major concern with reverse zoonosis events is the potential for disease reservoirs to form, whereby reintroduction of pathogens into human populations could occur.
- Recently, one of the popular theories on Omicron suggested that a "reverse zoonotic event" could be behind omicron, where it may have evolved in an animal host — possibly a rodent — and thereafter jumped onto humans, triggering another wave of COVID-19 infections.
- **Hence, option (c) is correct.**

Q 24.B

- **The programme called Women's Involvement in Science and Engineering Research (WISER) program was launched by Indo-German Science & Technology Centre (IGSTC)** for encouraging women researchers in joint R&D projects. **Hence statement 2 is correct.**

Join Telegram- https://t.me/upsc_success_time1

- It is launched to promote women in the field of research and development by lateral entry.
- This programme was launched in addition to the ongoing flagship 2+2 program of the IGSTC.
- This program by IGSTC, a joint initiative of the **Department of Science and Technology (DST), Government of India and the Federal Ministry of Education and Research (BMBF),** Government of Germany,
- It will support women scientists holding regular/long term research positions in academia or research institutes/industries.
- **Involvement in the program will be possible through lateral entry. There is neither requirement of break-in-career nor any age limit, and it will enable easy participation. Hence statement 1 is not correct.**

Q 25.A

- **Arteries are the vessels which carry blood away from the heart to various organs of the body**. Since the blood emerges from the heart under high pressure, **the arteries have thick, elastic walls**.
- **Veins collect the blood from different organs and bring it back to the heart**. They **do not need thick walls** because the blood is no longer under pressure, instead they have valves that ensure that the blood flows only in one direction.
- **Hence, only statement 1 is correct**.

Q 26.C

- **An inter-state dispute between Karnataka and Maharashtra dating back to the period of Independence and the reorganisation of states on linguistic lines in 1956 has reared its head again in the Belagavi region of Karnataka. Hence option (c) is the correct answer.**
- Belagavi was part of the Bombay presidency during independence and the issue arise during the reorganisation of the state on linguistic lines in 1956.
- Claim by two
- Maharashtra – Belagavi is a largely Marathi speaking region with many parts being exclusively for Marathi speaking.
- Karnataka – Marathi population is only 35% which is on par with Kannada speaking population of the region.

Q 27.B

- Femur is the thigh bone. It is the longest and strongest bone in the human body.
- The **sternum** or breastbone is a long flat bone located in the central part of the chest. It connects to the ribs via cartilage and forms the front of the rib cage, thus helping to protect the heart, lungs, and major blood vessels from injury.
- The **patella**, also known as the kneecap, is a thick, circular-triangular bone which articulates with the femur (thigh bone) and covers and protects the anterior articular surface of the knee joint.
- **Hence option (b) is the correct answer.**

Q 28.D

- Recombinant DNA (rDNA) molecules are DNA molecules formed by laboratory methods of genetic recombination i.e. molecules of DNA from two different species that are inserted into a host organism to produce new genetic combinations that are of value to science, medicine, agriculture, and industry.
- **Applications of Recombinant DNA:**

Join Telegram- https://t.me/upsc_success_time1

- Through recombinant DNA techniques, bacteria have been created that are capable of synthesizing **human insulin, human growth hormone, alpha interferon, hepatitis B vaccine,** and other medically useful substances. **Hence option 1 is correct.**
- Recombinant DNA technology also can be used for gene therapy, in which a normal gene is introduced into an individual's genome in order to repair a mutation that causes a genetic disease.
- The ability to obtain specific DNA clones using recombinant DNA technology has also made it possible to add the DNA of one organism to the genome of another. The added gene is called a transgene, which can be passed to progeny as a new component of the genome. The resulting organism carrying the transgene is called a transgenic organism or a **genetically modified organism (GMO)**. In this way, a "designer organism" is made that contains some specific change required for an experiment in basic genetics or for improvement of some commercial strain.
- Genetically transformed plants which contain foreign genes are called transgenic plants. Resistance to diseases, insects and pests, herbicides, drought; metal toxicity tolerance; induction of male sterility for plant breeding purpose; and improvement of quality can be achieved through this recombinant DNA technology. BT-cotton, resistant to bollworms is a glaring example. **Hence option 2 is correct.**
- Recombinant DNA technology has provided a broad range of tools to help physicians in the diagnosis of diseases. Most of these involve the construction of probes: short Segments of single-stranded DNA attached to a radioactive or fluorescent marker. Such probes are now used for the identification of infectious agents, for instance, food poisoning Salmonella, hepatitis virus, HIV, etc. **Hence option 3 is correct.**
- In industries, recombinant DNA technology will help in the production of chemical compounds of commercial importance, improvement of existing fermentation processes, and production of proteins from wastes. This can be achieved by developing more efficient strains of microorganisms. Specially developed microorganisms may be used even to clean up the pollutants. **Hence option 4 is correct.**

Q 29.D

- **Corrosion** is a process through which metals in manufactured states return to their natural oxidation states. This process is a reduction-oxidation reaction in which the metal is being oxidized by its surroundings, often the oxygen in the air. This reaction is both spontaneous and electrochemically favoured. Corrosion is essentially the creation of voltaic, or galvanic, cells where the metal in question acts as an anode and generally deteriorates or loses functional stability.
- **Rancidity,** it is the natural process of decomposition (degradation) of fats or oils by either hydrolysis or oxidation, or both. It is the complete or incomplete oxidation or hydrolysis of fats and oils when exposed to air, light, or moisture or by bacterial action, resulting in unpleasant taste and odour.
- **Combustion** is an oxidation reaction. During combustion, burning of fuel takes place in the presence of oxygen. If oxygen is not present burning will not take place.
- **Hence option (d) is the correct answer.**

Q 30.A

- **The term "founder effect" refers to the observation that when a small group of individuals breaks off from a larger population and establishes a new population, chance plays a large role in determining which alleles (a variant form of a gene) are represented in the new population.** The particular alleles may not be representative of the larger population. As the new population grows, the allele frequencies will usually continue to reflect the original small group.
- A founder effect occurs when a new colony is started by a few members of the original population. This small population size means that the colony may have:
  - **reduced genetic variation from the original population**.
  - a non-random sample of the genes in the original population.
- **Hence option (a) is the correct answer.**

Q 31.A

- Hard water is water that has high mineral content (in contrast with soft water). Hard water is formed when water percolates through deposits of limestone, chalk or gypsum which are largely made up of calcium and magnesium carbonates, bicarbonates and sulfates.
- **Hard-drinking water** is generally not harmful to one's health but can pose serious problems in industrial settings, where water hardness is monitored to avoid costly breakdowns in boilers, cooling towers, and other equipment that handles water. In domestic settings, hard water is often indicated by a lack of suds formation when soap is agitated in water.

Join Telegram- https://t.me/upsc_success_time1

- **Permanent hardness is caused by dissolved calcium sulphate. Permanent hardness is hardness (mineral content) that cannot be removed by boiling.**
- **Distillation** can be used to separate and collect a liquid from a solution. Distillation can also be used to soften water as the water evaporates as it is heated and the ions are left behind. Hard water can be softened by adding sodium carbonate (washing soda) or by passing the water through an ion-exchange column.
- **Caustic soda (Sodium hydroxide)**, NaOH removes both temporary and permanent hardness by precipitating the metal ions which cause the hardness as insoluble hydroxides
- Temporary hardness is a type of water hardness caused by the presence of dissolved bicarbonate minerals (calcium bicarbonate and magnesium bicarbonate).
- **Hence only options 1, 2, and 4 are correct.**

Q 32.D

- While it is estimated that the Earth is 4.5 billion years old, life began to appear approximately 3.5 billion years ago. Evolution of vertebrates (those having a backbone) occurred in the following order: Fish, Amphibia, Reptiles, Birds and Mammals.
- **Hence, the correct sequence is Cat fish-Tortoise-Kiwi-Otter.**

Q 33.D

- 5G is the communications backbone that will enable revolutionary applications in other markets, including industrial, automotive, medical and even defense. For a world that is becoming increasingly connected with the Internet of Things (IoT), 5G's significant improvements in speed (at least 10 times faster than 4G, up to 10 Gbps), latency (10 times lower than 4G, down to 1 ms) and density (supporting 1 million IoT devices per square kilometer) will make many innovative applications possible – especially those in which security, reliability, quality of service, efficiency and cost are equally important.
- **The Internet of Things** is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.
- **Edge Computing:** Edge computing means taking real-time decisions close to the source of data. By locating computational intelligence close to the individual and different sources of the data, edge computing reduces latency in the implementation of a requested service. Instead of sending data through the entire core network to the cloud for processing, edge computing uses a distributed network architecture to ensure near-real-time processing with reduced delays, which would otherwise simply not be acceptable for the specific service.
- **Network Slicing:** Network slicing allows operators to separate the packet traffic layer from the control layer, supporting multiple applications and services running in parallel for a range of users who require different levels of quality, latency, and bandwidth. This means that 5G systems will have many logical network slices, or "fast-track lanes," to support specific applications and customers.

Q 34.C

- Halogen element, any of the six nonmetallic elements that constitute Group 17 (Group VIIa) of the periodic table. The halogen elements are fluorine (F), chlorine (Cl), bromine (Br), iodine (I), astatine (At), and tennessine (Ts). They were given the name halogen, from the Greek roots hal- ("salt") and -gen ("to produce"), because they all produce sodium salts of similar properties, of which sodium chloride—table salt, or halite—is best known. **Hence statement 1 is correct.**
- Because of their great reactivity, the free halogen elements are not found in nature. In combined form, fluorine is the most abundant of the halogens in Earth's crust. The percentages of the halogens in the igneous rocks of Earth's crust are 0.06 fluorine, 0.031 chlorine, 0.00016 bromine, and 0.00003 iodine. Astatine and tennessine do not occur in nature, because they consist of only short-lived radioactive isotopes. **Hence statement 2 is correct.**

Q 35.C

- Plant growth regulators are variously described as plant growth substances, plant hormones or phytohormones in literature. The PGRs can be broadly divided into two groups based on their functions in a living plant body. One group of PGRs are involved in growth promoting activities, such as cell division, cell enlargement, pattern formation, tropic growth, flowering, fruiting and seed formation. These are also called plant growth promoters, e.g., **auxins, gibberellins** and **cytokinins**.
- The PGRs of the other group play an important role in plant responses to wounds and stresses of biotic and abiotic origin. They are also involved in various growth inhibiting activities such as dormancy and

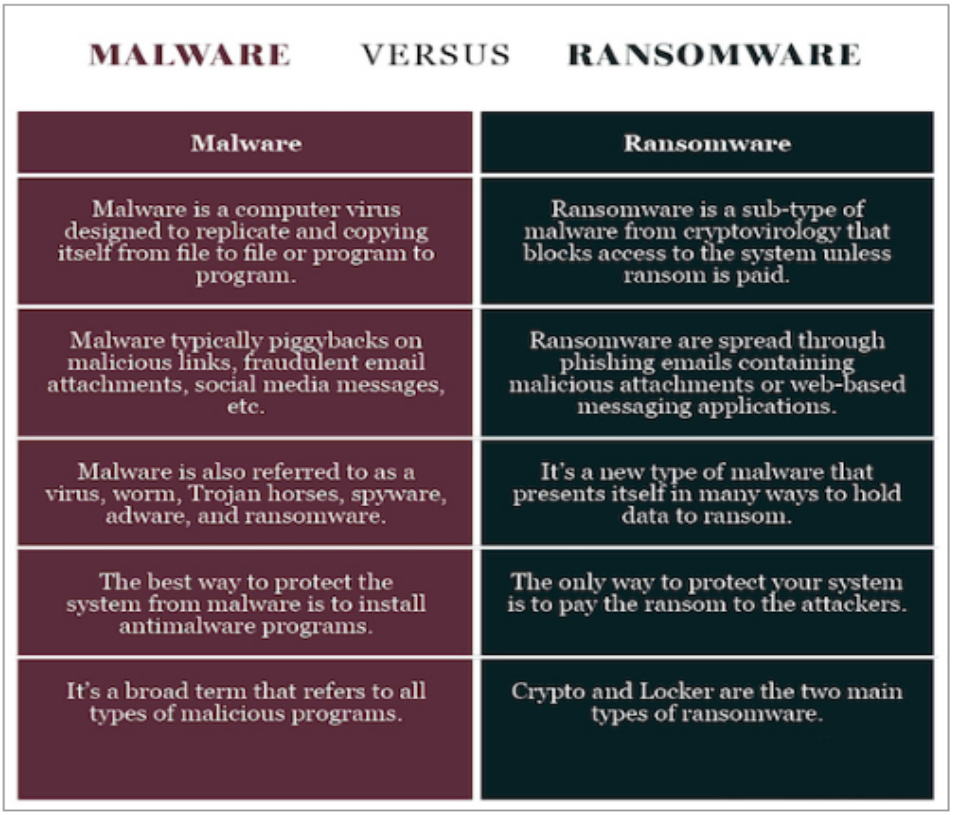
Join Telegram- https://t.me/upsc_success_time1

abscission. The PGR abscisic acid belongs to this group. The gaseous PGR, ethylene, could fit either of the groups, but it is largely an inhibitor of growth activities.

- **Hence option (c) is the correct answer.**

Q 36.A

- **Malware is any malicious code or program that gives an attacker explicit control over your system. It's a broad terms that may refer to all types of malicious programs including viruses, bugs, worms, bots, rootkits, spyware, adware, Trojans, and even ransomware**. It acts like an inside agent that installs malicious codes on your computer or trick you into loading a malicious program either through malicious email attachments or web-based messaging applications. As a result, the attacker gets hold of your system and the system won't respond to your commands anymore.
- Ransomware is a sub-set of malware which is designed to target **individuals or organizations.** It's a type of malware that allows the attackers to gain full control of the system and restricts access to the personal and confidential files unless a ransom is paid. **It is a malicious program that locks up the system files and encrypts them, and demands a ransom from the user to unlock the system**. There are three main modes of distribution for the major ransomware families. One of the ways ransomware spreads is by replicating itself rapidly to other computers for maximum impact. Ransomware that spread by replicating itself is called a 'cryptoworm'.The WannaCry attack that caused damage worldwide in 2017 is an example of this. This malware also spread as ransomware-as-a-service (RaaS). The third most common way of their spread is as automated active adversary attack, where attackers manually deploy the ransomware following an automated scan of networks for systems with weak protection.
- **Statement 2 is not correct: M**alware and ransomware can affect computer, phone, or tablet to larger systems, such as servers and databases. Some of the recent ransomware include WannaCry, Ryuk, Bad Rabbit, Cerber, GandCrab, Jigsaw, Katyusha, LockerGoga, PewCrypt, SamSam etc.



Q 37.B

- Human Papillomavirus Vaccines (HPV) protect against infection with **Human Papillomaviruses (HPV).**
- HPV is a group of more than 200 related viruses, of which more than 40 are spread through **direct sexual contact.**
- Among these, two HPV types cause genital warts, and about a dozen HPV types can cause certain types of cancer—**cervical, anal, oropharyngeal, penile, vulvar, and vaginal.**
- Clinical trials have shown that **HPV vaccines are highly effective in preventing cervical infection** with the types of HPV they target when given before first exposure to the virus that is before individuals begin to engage in sexual activity.

Join Telegram- https://t.me/upsc_success_time1

- All HPV vaccines protect against at least **HPV types 16 and 18, which cause the greatest risk of cervical cancer.**
- It is estimated that HPV vaccines may prevent **70% of cervical cancer, 80% of anal cancer, 60% of vaginal cancer, 40% of vulvar cancer, and show more than 90% efficacy in preventing HPV-positive oropharyngeal cancers.**
- **Hence, option (b) is the correct answer.**

Q 38.A

- Allotropes are different forms of the same element. Different bonding arrangements between atoms result in different structures with different chemical and physical properties.
- Fullerene, also called buckminsterfullerene, is an allotrope of carbon. It is a cage-like structure in which molecules are composed of 60 carbon atoms (C60) joined together by single and double bonds to form a hollow sphere with 12 pentagonal and 20 hexagonal faces—a design that resembles a football, or soccer ball.
- Graphene is a one-atom-thick layer of carbon atoms arranged in a hexagonal lattice. It is the crystalline allotrope of carbon. It is the building-block of Graphite (which is used, among others things, in pencil tips. **Hence statement 1 is correct**
- Graphene is a good conductor of electricity because one carbon atom is bonded only with three carbon atoms, which enables the presence of free electrons. Fullerenes in pure state act as insulators but can be converted to semiconductors and superconductors under suitable conditions. **Hence statement 2 is not correct.**

Q 39.C

- **The Fifth Generation or 5G telecom services are set to be rolled out in selected cities in India in 2022.** The cities which are set to get the 5G telecom services in 2022 include Gurugram, Bangalore, Kolkata, Mumbai, Chandigarh, Delhi, Jamnagar, Ahmadabad, Chennai, Hyderabad, Lucknow, Pune, and Gandhinagar.
- **The fifth-generation is the latest upgrade in the long-term evolution (LTE)** mobile broadband networks. 5G mainly works in 3 bands, low, mid, and high-frequency spectrum.
- **In the low band spectrum, the speed is limited to 100 Mbps (Megabits per second) but it has greater coverage and penetration of the network. It covers any spectrum that is lower than 1GHz. Hence statement 1 is correct.**
- **The mid-band spectrum**, on the other hand, offers higher speeds compared to the low band but has limitations in terms of coverage area and penetration of signals. It falls between **1GHz to 6GHz range.**
- **Internet speed in the high-band spectrum goes up to 20 Gbps (giga bits per second). High band spectrum falls in the chart range of 24GHz and higher. Hence statement 2 is correct.**

Q 40.C

Color Type	**Area of Biotech Activities**
Red	: Health, Medical, Diagnostics
Yellow	: Food Biotechnology, Nutrition Science
Blue	: Aquaculture, Coastal and Marine Biotech
Green	: Agricultural, Environmental Biotechnology – Biofuels
Brown	: Arid Zone and Desert Biotechnology
Dark	: Bioterrorism, Biowarfare, Biocrimes, Anticrop warfare
Purple	: Patents, Publications, Inventions, IPRs
White	Gene-based Bioindustries
Gold	Bioinformatics, Nanobiotechnology

- **Hence option (c) is the correct answer.**

Q 41.B

- **A biosimilar** is a biologic medical products (**Biotherapeutics**) **highly similar** to another already approved biological medicine (the 'reference medicine'). Biosimilars are approved according to the same standards of pharmaceutical quality, safety and efficacy that apply to all biological medicines.. Biosimilars are officially approved versions of original "innovator" products and can be manufactured when the original product's patent expires.
- **Biotherapeutics** are **pharmaceutical products derived from biological and living sources**. They include therapeutic vaccines, blood, blood components, cells, gene therapies, tissues and other materials.
- Biosimilars are often confused with generic medicines — **but they are not exactly the same.**

Join Telegram- https://t.me/upsc_success_time1

- **Generic medicines are chemically synthesized while biosimilars are grown in complex living systems. Hence statement (b) is not correct.**
- Biological medicines are large, complex molecules or mixtures of molecules that may be composed of living material — as such, biosimilars are unlikely to be exact copies of their reference product

- Recently, **The World Health Organization (WHO) prequalified its first biosimilar medicine – trastuzumab** – in a move that could make this expensive, **life-saving treatment more affordable and available to women globally**. Trastuzumab – a monoclonal antibody – was included in the WHO Essential Medicines List in 2015 as an essential treatment for about 20% of breast cancers. It has shown high efficacy in curing early stage breast cancer and in some cases more advanced forms of the disease. Biotherapeutic medicines, which are produced from biological sources such as cells rather than synthesized chemicals, are important treatments for some cancers and other non-communicable diseases. Like generic medicines, biosimilars can be much less expensive versions of innovator biotherapeutics while keeping the same effectiveness. They are usually manufactured by other companies once the patent on the original product has expired.
- **Hence option (b) is the correct answer.**

Q 42.D

- **Viruses are acellular entities that can usually only be seen with an electron microscope. Viruses consist of a nucleic-acid core surrounded by a protein capsid with or without an outer lipid envelope. Hence it is difficult to kill virus because they lack cellular structure.**
- Their genomes contain either DNA or RNA, and **they replicate using the replication proteins of a host cell.** Viruses are diverse, infecting archaea, bacteria, fungi, plants, and animals.
- **Hence, both statements are correct.**

Q 43.C

- Polytetrafluoroethene (Teflon): Teflon is manufactured by heating tetrafluoroethene with a free radical or persulphate catalyst at high pressures. **It is chemically inert and resistant to attack by corrosive reagents.**
- **It is used in making oil seals and gaskets and also used for non – stick surface coated utensils**.
- Other advantage of Teflon is its versatility, and the range of applications over so many products and different industries for this material is staggering. The use of teflon can have massive benefits in manufacturing and engineering, not just in making tubes or liners for handling or storing corrosive chemicals, but by coating parts such as bearings or screws to increase the lifetime of both the parts themselves and the machinery they are part of. **Hence statement 1 and 2 are correct.**

Q 44.B

- Conductors, semiconductors, and insulators are classified on the basis of conductivity/resistivity.
- Conductors possess very low resistivity (or high conductivity).
- Semiconductors have resistivity or conductivity intermediate to conductors and insulators.
- Insulators have high resistivity (or low conductivity).
  - Thus resistivity of semiconductors is more than conductors but less than insulators. **Hence statement 1 is not correct.**
- Semiconductors can be :
  - Elemental semiconductors: Silicon(Si) and Germanium(Ge)
  - Compound semiconductors: Examples are:
    - Inorganic: CdS, GaAs, CdSe, InP, etc.
    - Organic: anthracene, doped pthalocyanines, etc.
    - Organic polymers: polypyrrole, polyaniline, polythiophene, etc.
- Most of the currently available semiconductor devices are based on elemental semiconductors Si or Ge and compound inorganic semiconductors. **Hence statement 2 is correct.**

Q 45.D

- Astronomers from the Pune-based **National Centre for Radio Astrophysics (NCRA)** have discovered eight stars that belong to a rare class called **Main-sequence Radio Pulse emitters or MRPs.** MRPs were discovered using **'Giant Metre-wave Radio Telescope (GMRT)' l**ocated in Pune.
- There are 15 known MRPs so far. 11 MRPs were discovered with GMRT. Eight of MRPs were discovered in 2021 alone. Of the total 15 MRPs known so far, **11 have been discovered by the NCRA-TIFR team alone.**
- **The Main-sequence Radio Pulse' emitters (MRPs) are stars hotter than Sun with unusually strong magnetic fields. Hence statement 1 is correct.**

Join Telegram- https://t.me/upsc_success_time1

- **MRPs eject gases much stronger than stellar wind (a continuous flow of gas from a star's upper atmosphere). Hence statement 3 is correct.**
- Due to this activity, they emit **bright radio pulses like a lighthouse.**
- These findings will prove crucial in understanding what switches off the production of radio pulses in a hot magnetic star.
- **The pulsed radio emission from MRPs is the only visible sign of the theoretical models which predicts tiny explosions in magnetic massive stars that occur at specific locations in the magnetosphere of the star. Hence statement 2 is correct.**
- These explosions have been predicted to play an important role in regulating the transport of wind materials surrounding the star, and are likely to affect the stellar evolution as well.

Q 46.C

- Ozone or trioxygen is an inorganic molecule with the chemical formula O_3. It is an allotrope of oxygen that is much less stable than the diatomic allotrope O_2. It is a pale blue gas with a distinctively pungent smell. **Hence statement 1 is not correct.**
- Ozone is formed from dioxygen by the action of ultraviolet light (UV) and electrical discharges within the Earth's atmosphere. It is present in very low concentrations throughout the latter, with its highest concentration high in the ozone layer of the stratosphere, which absorbs most of the sun's ultraviolet (UV) radiation. **When an ozone molecule absorbs even low-energy ultraviolet radiation,** it splits into an ordinary oxygen molecule and a free oxygen atom. Usually, this free oxygen atom quickly re-joins with an oxygen molecule to form another ozone molecule. **Hence statement 2 is correct.**
- It is slightly soluble in water and much more soluble in inert-polar solvents such as carbon tetrachloride or fluorocarbons, where it forms a blue solution. Ozone is a powerful oxidizing agent, far stronger than O_2. **One common method of disinfecting wastewater is ozonation** (also known as ozone disinfection). Ozone is an unstable gas that can destroy bacteria and viruses. In fact, it is more effective than chlorine in destroying viruses and bacteria. **Hence statement 3 is correct.**
- Ozone decomposes rapidly, and therefore, it leaves no harmful residue that would need to be removed from the wastewater after treatment.

Q 47.D

- Sound bounces off a solid or a liquid like a rubber ball bounces off a wall. Like light, sound gets reflected at the surface of a solid or liquid and follows the laws of reflection.
- The directions in which the sound is incident and is reflected make equal angles with the normal to the reflecting surface at the point of incidence, and the three are in the same plane. An obstacle of large size which may be polished or rough is needed for the reflection of sound waves.
- If we shout or clap near a suitable reflecting object such as a tall building or a mountain, we will hear the same sound again a little later. This sound which we hear is **called an echo**. The sensation of sound persists in our brain for about 0.1 s.
- For hearing distinct echoes, the minimum distance of the obstacle from the source of sound must be half of this distance, that is, 17.2 m. This distance will change with the temperature of air. Echoes may be heard more than once due to successive or multiple reflections. The rolling of thunder is due to the successive reflections of the sound from a number of reflecting surfaces, such as the clouds and the land.
- **A sound created in a big hall will persist by repeated reflection from the walls until it is reduced to a value where it is no longer audible. The repeated reflection that results in this persistence of sound is called reverberation**.
    - In an auditorium or big hall excessive reverberation is highly undesirable. To reduce reverberation, the roof and walls of the auditorium are generally covered with sound-absorbent materials like compressed fibreboard, rough plaster or draperies. The seat materials are also selected on the basis of their sound absorbing properties.
    - **Hence option (d) is the correct answer.**

Q 48.A

- The red color of blood is due to the presence of hemoglobin. It is an iron-rich compound and provides red color to red blood cells. They are responsible for red color of blood. White blood cells are colorless due to the lack of hemoglobin. White blood cells are also known as Leucocytes. **Hence statement 1 is correct.**
- The lines of defense against diseases:
- The first line of defense (or outside defense system) includes physical and chemical barriers that are always ready and prepared to defend the body from infection. These include your skin, tears, mucus, sweating etc.

Join Telegram- https://t.me/upsc_success_time1

- The second line of defense is a group of cells, tissues, and organs that work together to protect the body. This is the immune system.The cells involved are white blood cells (leukocytes), which seek out and destroy disease-causing organisms or substances. **Hence statement 2nd is not correct.**
- If the pathogens are able to get past the first line of defense, for example, through a cut in your skin, and an infection develops, the second line of defense becomes active. Through a sequence of steps called the immune response, the immune system attacks these pathogens.

Q 49.A

- **The Indian Railways launched Bharat Gaurav trains that will be operated by private players and run on theme-based circuits. Hence statement 1 is correct.**
- **Through this policy, which offers operators the "Right of Use" of its rakes and infrastructure, Hence statement 2 is correct.**
- The Railways has liberalised and simplified a part of operations that was otherwise carried out mostly by the Indian Railway Catering and Tourism Corporation (IRCTC). While any entity can run these trains, including state governments, it is implied that the policy is targeted at tour operators.
- The tenure of the arrangement is a minimum of two years and a maximum of the codal life of the coach.
- The Bharat Gaurav operator will also have to propose a similar business model wherein it takes care of local transport, sightseeing, food, local stays, etc. along with operating the trains.
- **Under this programme, private players and tour operators can procure trains from railways on lease and operate them on any circuit of their choice and decide fares, routes, and quality of services. Hence statement 3 is not correct.**
- However, the railways will ensure that there is no abnormality in the prices.

Q 50.D

- All the given are used as Performance-enhancing drug:
- **Erythropoietin (EPO):** Taking erythropoietin, or EPO, increases red blood cell production without the need for transfusions. The kidneys make the hormone naturally, although people with severe kidney disease don't have enough.
- **Human growth hormone (hGH):** It mimics the muscle-building effects of anabolic steroids. It occurs naturally in the body. In fact, the pituitary gland, the pea-sized organ located at the base of the brain, produces hGH to stimulate growth in children and adolescents and to increase muscle mass in adults.
- **Testosterone:** Occurring naturally in the body, testosterone has two distinct modes of action, androgenic (masculinizing) and anabolic (tissue building).
- **Insulin:** Insulin is a popular performance-enhancing drug for bodybuilders, who use it to boost their stamina.
- **Hence option (d) is the correct answer.**

Q 51.A

- Animals have evolved different organs for the uptake of oxygen from the environment and for getting rid of the carbon dioxide produced. Terrestrial animals can breathe the oxygen in the atmosphere, but animals that live in water need to use the oxygen dissolved in water.
- **Since the amount of dissolved oxygen is fairly low compared to the amount of oxygen in the air, the rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms**. **Fishes take in water through their mouths and force it past the gills where the dissolved oxygen is taken up by blood**.
- **Hence, only statement 1 is correct**.

Q 52.C

- Central Government in exercise of the powers conferred by clause (zg) of sub-section (2) of section 101 read with section 94 of the Consumer Protection Act, 2019 **has notified the Consumer Protection (Direct Selling) Rules, 2021. It has been notified by the Ministry of Consumer Affairs, Food & Public Distribution in the exercise of the powers conferred by the Consumer Protection Act, 2019. Hence statement 1 is correct.**
- These Rules **shall apply to all goods and services bought or sold through direct selling**, all models of direct selling, all direct selling entities offering goods and services to consumers in India, all forms of unfair trade practices across all models of direct selling and also to also to a direct selling entity which is not established in India, but offers goods or services to consumers in India.
- **Direct Selling is selling products directly to the consumers in a non-retail environment and these sales occur at home, work, online and non-store locations.** The rules lay down duties and obligations of both direct selling entities and their direct sellers to "safeguard the interest of consumers''.

Join Telegram- https://t.me/upsc_success_time1

- The Rules provide for **certain obligation upon Direct Sellers** which inter alia include :-
  - have a prior written contract with the direct selling entity for undertaking sale of, or offer to sell, any goods or services of such entity;
  - at the initiation of any sale representation, truthfully and clearly identify himself, disclose the identity of the direct selling entity, the address of place of business, the nature of goods or services sold and the purpose of such solicitation to the prospect;
  - make an offer to the prospect providing accurate and complete information, demonstration of goods and services, prices, credit terms, terms of payment, return, exchange, refund policy, return policy, terms of guarantee and after-sale service.
  - provide an order form to the consumer at or prior to the time of the initial sale, which shall identify the direct selling entity and the direct seller and shall contain the name, address, registration number or enrollment number, identity proof and contact number of the direct seller, complete description of the goods or services to be supplied, etc , consumer's rights to cancel the order or to return the product in saleable condition and avail full refund on sums paid and complete details regarding the complaint redressal mechanism of the direct selling entity;
  - obtain goods and service tax registration, Permanent Account Number registration, all applicable trade registrations and licenses and comply with the requirements of applicable laws, rules and regulations for sale of a product; etc.
- **Direct selling entity and direct sellers are prohibited from:**
  - Promoting a Pyramid Scheme or enroll any person to such scheme or participate in such arrangement in any manner whatsoever in the garb of doing direct selling business;
  - **Participate in money circulation scheme in the garb of doing direct selling business.**
- Rules provide for monitoring by State Government.— **For ensuring compliance of these rules by direct selling entity and direct sellers, every State Government to set up a mechanism to monitor or supervise the activities of direct sellers and direct selling entity. Hence statement 2 is correct.**

Q 53.A

- Recently, Starlink satellite's near-collision with Chine station puts focus on space jam.
- **The Kessler Syndrome is a phenomenon in which the amount of junk in orbit around Earth reaches a point where it just creates more and more space debris, causing big problems for satellites, astronauts and mission planners. Hence option (a) is the correct answer.**
- **Turner syndrome** is a genetic disorder affecting girls and women. The cause of Turner syndrome is a completely or partially missing X chromosome. Turner syndrome symptoms include short stature and lack of breast development and periods. Treatment for Turner syndrome may include hormone therapy.
- **Klinefelter syndrome** is a genetic condition that results when a boy is born with an extra copy of the X chromosome. Klinefelter syndrome is a genetic condition affecting males, and it often isn't diagnosed until adulthood.
- **Space Adaptation Syndrome** is a type of motion sickness probably caused by an astronaut's inability to distinguish up from down while in orbit. This confusion results in dizziness and nausea.

Q 54.D

- The prokaryotic cells are represented by bacteria, blue-green algae, mycoplasma and PPLO (Pleuro Pneumonia Like Organisms). They are generally smaller and multiply more rapidly than the eukaryotic cells.
- Prokaryotes have a cell wall surrounding the cell membrane except in mycoplasma. The fluid matrix filling the cell is the cytoplasm. There is no well-defined nucleus. The genetic material is basically naked, not enveloped by a nuclear membrane. In addition to the genomic DNA (single chromosome/circular DNA), many bacteria have small circular DNA outside the genomic DNA. This smaller DNA are called plasmids. No organelles, like the ones in eukaryotes, are found in prokaryotic cells except for ribosomes. **Hence statement 1 is not correct.**
- The eukaryotes include all the protists, plants, animals and fungi. In eukaryotic cells, there is an extensive compartmentalisation of cytoplasm through t**he presence of membrane-bound organelles. Eukaryotic cells possess an organised nucleus with a nuclear envelope. Hence statement 2 is not correct**.
- In addition, eukaryotic cells have a variety of complex locomotory and cytoskeletal structures. Their genetic material is organised into chromosomes. All eukaryotic cells are not identical. Plant and animal cells are different as the former possess cell walls, plastids and a large central vacuole which are absent in animal cells. On the other hand, animal cells have centrioles which are absent in almost all plant cells.

Join Telegram- https://t.me/upsc_success_time1

Q 55.A

- There are two types of nitrogenous bases -
  - Purines **(Adenine and Guanine**), and
  - Pyrimidine (**Cytosine, Uracil and Thymine).**
- Cytosine is common for both DNA and RNA and Thymine is present in DNA. Uracil is present in RNA at the place of Thymine.
- **Hence option (a) is the correct answer.**

Q 56.C

- **Recent context : India became the fourth country in the world to have its independent regional navigation satellite system, IRNSS or NavIC recognized by the International Maritime Organisation (IMO) as a part of the World Wide Radio Navigation System (WWRNS).**
- The IRNSS can now replace GPS in the Indian Ocean waters up to 1500 km from the Indian boundary. With this, merchant vessels in Indian waters can now use the "modern and more accurate" system as an alternative navigation module.
- **IRNSS is an independent regional navigation satellite system developed by ISRO. It is designed to provide accurate position information service to users in India as well as the region extending up to 1500 km from its boundary, which is its primary service area. Hence, statement 1 is correct.**
- An Extended Service Area lies between the primary service area and area enclosed by the rectangle from Latitude 30 degrees South to 50 degrees North, Longitude 30 degrees East to 130 degrees East.
- **IRNSS will provide two types of services, namely, Standard Positioning Service (SPS) which is provided to all the users and Restricted Service (RS), which is an encrypted service provided only to the authorized users. Hence, statement 2 is correct.**
- At present, IRNSS is a constellation of 8 satellites-Three of the eight satellites are located in geostationary orbit (GEO) and the remaining five satellites are in inclined geosynchronous orbit (GSO).
- **Some applications of IRNSS are:**
  - Terrestrial, Aerial and Marine Navigation
  - Disaster Management
  - Vehicle tracking and fleet management
  - Integration with mobile phones
  - Precise Timing
  - Mapping and Geodetic data capture
  - Terrestrial navigation aid for hikers and travellers
  - Visual and voice navigation for drivers
- The IMO is the United Nations' specialized agency responsible for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships.

Q 57.C

- **Geoengineering:**
  - It is a deliberate, large-scale intervention carried out in the Earth's natural systems to reverse the impacts of climate change. This involves techniques to physically manipulate the global climate to cool the planet.
  - Its techniques fall primarily under three categories: Solar radiation management (SRM), carbon dioxide removal (CDR), and weather modification.
  - Solar radiation management refers to offsetting the warming effect of greenhouse gases by reflecting more solar radiation (sunlight) back into space.
  - Carbon dioxide removal refers to removing carbon dioxide gas (CO_2) from the atmosphere and sequestering it for long periods of time.
- **Specific technologies include:**
  - **Solar geoengineering** or 'dimming the sun' by spraying sulfates into the air to reflect sunlight back into space. **Hence statement 1 is correct.**
  - **LOHAFEX** is an ocean iron fertilization experiment to see if iron can cause algal bloom and trap carbon dioxide from the atmosphere. **Hence statement 2 is correct.**
  - **SPICE** is a research project that aimed to assess the feasibility of injecting particles into the stratosphere from a tethered balloon to manage solar radiation. **Hence statement 3 is correct.**
  - **Cloud brightening** or spraying saltwater to make clouds more reflective by seeding them with seawater.

Join Telegram- https://t.me/upsc_success_time1

Q 58.C

- **Thermoplastic polymers:** These are the linear or slightly branched long-chain molecules capable of repeatedly softening on heating and hardening on cooling. These polymers possess intermolecular forces of attraction intermediate between elastomers and fibers. Some common thermoplastics are **polythene, polystyrene, polyvinyl chlorides**, etc.
- **Thermosetting polymers:** These polymers are cross-linked or heavily branched molecules, which on heating undergo extensive cross-linking in moulds and again become infusible. These cannot be reused. Some common examples are **bakelite**, urea-formaldehyde resins, etc.
- **Hence option (c) is the correct answer.**

Q 59.D

- A gene mutation is a permanent alteration in the DNA sequence that makes up a gene, such that the sequence differs from what is found in most people. Mutations range in size; they can affect anywhere from a single DNA building block (base pair) to a large segment of a chromosome that includes multiple genes.
- **Gene mutations can be classified in two major ways:**
  - **Hereditary mutations** are inherited from a parent and are present throughout a person's life in virtually every cell in the body. These mutations are also called germline mutations because they are present in the parent's egg or sperm cells, which are also called germ cells. When an egg and a sperm cell unite, the resulting fertilized egg cell receives DNA from both parents. If this DNA has a mutation, the child that grows from the fertilized egg will have the mutation in each of his or her cells.
  - **Acquired (or somatic) mutations** occur at some time during a person's life and are present only in certain cells, not in every cell in the body. These changes can be caused by environmental factors such as ultraviolet radiation from the sun or can occur if an error is made as DNA copies itself during cell division. Acquired mutations in somatic cells (cells other than sperm and egg cells) cannot be passed to the next generation
- **Mutation is caused by Xrays; gamma rays; mustard gas, UV rays, nitrous acid etc.**
- **Hence option (d) is the correct answer.**

Q 60.C

- Pretomanid is the third **new drug developed for TB** in over half a century, after bedaquiline and delaminid. **It is a novel compound developed by non-profit organisation TB Alliance that has a collaboration with Mylan to commercialise the drug.**
- The new drug is part of a three-drug **(bedaquiline, pretomanid and linezolid**), six-month, all-oral regimen for the treatment of people with extensively drug-resistant TB (XDR-TB) or multidrug-resistant TB (MDR-TB) who are treatment-intolerant or non-responsive.
- However, concerns have emerged on registering pretomanid, the logistics of rolling out a three-drug combination, their individual safety features and its price in high-disease regions such as India.
- **Hence option (c) is the correct answer.**

Q 61.D

- The cell nucleus is a double membrane-bound organelle that contains the genetic information of the cell packaged in the form of chromatin. The nucleus is a characteristic feature of most eukaryotic cells. The nucleus is considered to be one of the most important structures of eukaryotic cells as it serves the function of information storage, retrieval and duplication of genetic information.
- The **nucleus contains RNA, DNA, proteins of two kinds, histone and nonhistone;** some lipids; various organic phosphorus compounds; and various inorganic compounds, mostly salts.
- **Hence option (d) is the correct answer.**

Q 62.D

- Department of Animal husbandry, Dairying and Fisheries (Ministry of Agriculture and Farmer's Welfare) in co-operation with 12 States has undertaken a Mass Embryo Transfer programme in Indigenous Breeds under the scheme, National Mission on Bovine Productivity. Under this programme, embryos of higher genetic merit indigenous bovines are being transferred in to surrogate cows. Embryos of Indigenous breeds such as Sahiwal, Gir, Red Sindhi, Ongole, Deoni and Vechur have been proposed to be transferred under this programme.
- It has been planned to carry out 440 embryo transfers during October 2-10, 2017 throughout the country. The programme is implemented with the objective of conservation and development of indigenous breeds under Rashtriya Gokul Mission.

Join Telegram- https://t.me/upsc_success_time1

- Through the use of ETT
  - **a farmer can get a 5-6 fold increase in number of offsprings ,**
  - **the calves so born will be of high genetic merit and**
  - **the offsprings born will be free from diseases.**
- **Hence option (d) is the correct answer.**

Q 63.B

- **PRIONS**
  - The term prion was coined to mean a proteinaceous (consisting of protein) infectious particles.
  - Prions are proteins that can trigger abnormal foldings in normal proteins.
  - They characterize several fatal and transmissible neurodegenerative diseases in humans and many other animals.
  - It is a mysterious infectious agent responsible for several neurodegenerative diseases found in mammals, including Creutzfeldt-Jakob disease (CJD) in humans. It refers to the initially heretical hypothesis that the infectious agent causing those diseases consists only of protein, with no nucleic acid genome. (All previously known pathogens, such as bacteria and viruses, contain nucleic acids, which enable them to reproduce.)
  - "Mad cow" disease is an infectious disease caused by prions that affect the brains of cattle.
  - **Hence option (b) is the correct answer.**
- **VIROIDS**
  - They are infectious entities affecting plants, smaller than a virus and consisting only of nucleic acid without a protein coat. They are the smallest known infectious pathogens.
- **VIRUS**
  - A virus is a small infectious agent that replicates only inside the living cells of an organism. Viruses can infect all types of life forms, from animals and plants to microorganisms, including bacteria and archaea. Most viruses have either RNA or DNA as their genetic material.
- **PROTOZOA**
  - Protozoa refer to single-celled eukaryotes, either free-living or parasitic, which feed on organic matter such as other microorganisms or organic tissues and debris.

Q 64.D

- **Surveying and Ranging**
  - Helium-neon and semiconductor lasers have become standard parts of the field surveyor's equipment. A fast laser pulse is sent to a corner reflector at the point to be measured and the time of reflection is measured to get the distance.
  - The Apollo 11 and Apollo 14 astronauts put corner reflectors on the surface of the Moon for **determination of the Earth-Moon distance.**
  - Positions of ground stations in relation to a mirror-bearing satellite can be measured with extreme accuracy by timing the reflected returns of laser pulses transmitted from those stations, which helps in **verifying the continental drift.**
- **Barcode Scanners**
  - Supermarket scanners typically use helium-neon lasers to scan the universal barcodes to identify products. The laser beam bounces off a rotating mirror and scans the code, sending a modulated beam to a light detector and then to a computer that has the product information stored. Semiconductor lasers can also be used for this purpose.
- **Tunable Diode Laser Absorption Spectroscopy**
  - (TDLAS) has proven to be a promising technology that can be used in challenging measurements in atmospheric research and monitoring pollution. Using the Beer-Lambert extinction law, at a wavelength slightly different from the absorption lines, there will be no absorption, and thus by scanning the wavelength across the absorption lines of the target gas, one can deduce the concentration of the gas molecules present in the atmosphere. The measurements are expressed in terms of parts per million, times meter, (ppm.m) or (ppmv.m). The most prominent gases released into the atmosphere are CO2, CO, O3, which destroy the chlorofluorocarbons, (CFC's), CH4, NO, NO2, etc.
- **Hence all the four options are correct.**

Q 65.D

- **Recently, the UN peacekeeping chief warned that the crisis in Africa's Sahel region remains volatile, with insecurity and instability seriously undermining prospects for development and many lives lost every day as a result of terrorist attacks.**

Join Telegram- https://t.me/upsc_success_time1

- **G5 Sahel countries – Burkina Faso, Chad, Mali, Mauritania and Niger** – face a number of challenges, including the growing threat of terrorism and organized crime, climate change and demographic growth. **Hence option (d) is the correct answer.**
- These are leading causes of institutional fragility in the region.
- To coordinate their actions, the Heads of State of the region created the G5 Sahel in 2014, an intergovernmental cooperation framework, in order to put forward a regional response to the various challenges.
- **One of the structures launched by the G5 in the field of security is the G5 Sahel Joint Force, created in 2017 by the 5 States of the region.**

Q 66.A

- **Recently, The Department of Telecommunications (DoT) has reprimanded Elon Musk's Starlink Internet Services for pre-selling and booking the satellite-based internet services without having obtained the necessary licences in the country.** It is asked to "refrain from booking/rendering the satellite internet services in India with immediate effect".
- **Starlink is one of a growing number of companies launching small satellites as part of a low-Earth orbiting network to provide low-latency broadband internet services around the world, with a particular focus on remote areas that are terrestrial internet infrastructure struggles to reach. Hence option (a) is the correct answer.**
- Starlink plans to "carry on the business of telecommunication services" including **satellite broadband internet services, content storage** and **streaming, multi-media communication**, among others.
- It will also deal in devices such as satellite phones, network equipment, wired and wireless communication devices, as well as data transmission and reception equipment.

Q 67.B

- An elementary particle is a particle that is not made up of any smaller particles. Elementary particles are the building blocks of the universe. There are two main categories of elementary particles: fermions and bosons.
- **Fermions are the matter particles**. All matter is made up of fermions. Fermions are divided into two types of particles: quarks and leptons. Quarks are the basic building blocks for protons and neutrons. Electrons and Neutrinos are included in the category of leptons. **Bosons are force-carrying particles.** This means that they are made up of tiny bundles of energy. **Photons, Gluons, Higgs Boson are examples of bosons. Hence statements 1 and 2 are not correct.**
- The name boson was coined to commemorate the contribution of Satyendra Nath Bose, and Albert Einstein in formulating Bose-Einstein statistics which theorizes the characteristics of elementary particles.
- Bosons follow **Bose-Einstein statistics.** Bosons have, by definition, integer spin. For instance, the spin of a photon is either +1 or -1 and the spin of a 4He atom is always zero. Many bosons can occupy a single quantum state. This allows them to behave collectively and is responsible for the behavior of lasers and superfluid helium. Only one fermion can exist in a given quantum state. This is known as the **Pauli exclusion principle.**
- In particle physics, a massless particle is an elementary particle whose invariant mass (total mass of an object independent of the motion of the system) is zero. The two known **massless particles are - the photon (carrier of electromagnetism) and the gluon (carrier of the strong force).** While Higgs Boson has a very tiny weight of around 220×10^{27}kg. **Hence statement 3 is correct.**

Q 68.C

- **Free Space Optical (FSO) is a communication system where free space acts as a medium between transceivers and data is transmitted by the propagation of light in free space allowing optical connectivity. The medium can be air, outer space, or vacuum. Hence statement 1 is correct.**
- Working of FSO is similar to OFC (optical fiber cable) networks but the only difference is that the optical beams are sent through free air instead of OFC cores that are glass fiber.
- **FSO is a LOS (line of sight) technology,** where data, voice, and video communication is achieved with maximum 10Gbps of data rate by full-duplex (bidirectional) connectivity
- **<u>Applications:</u>**
  - It can be used by wireless service providers for communication and it requires no license to use the FSO as it is required in case of microwave bands.
  - FSO links can be used to form a Storage Area Network (SAN). It is a network that is known to provide access to consolidated, block-level data storage.

Join Telegram- https://t.me/upsc_success_time1

- To lay cables of users in the last mile is very costly for service providers as the cost of digging to lay fiber is so high and it would make no sense to lay as much fiber as possible. FSO can be used to solve such a problem by implementing it in the last mile along with other networks.
- FSO systems are easily installable. This feature makes it applicable for interconnecting LAN segments to connect two buildings or other property.
- Providing a backup link in case of failure of transmission through a fiber link
- Extending the fiber rings of an existing metropolitan area.
- To provide instant service to customers when their fiber infrastructure is being deployed in the meantime.
- **To communicate between point-to-point links, for example, two buildings, two ships, and point-to-multipoint links, for example, from aircraft to ground or satellite to ground, for short and long reach communication. Hence statement 2 is correct.**
- As it is a secure and undetectable system it can connect large areas safely with minimal planning and deployment time and is hence suitable for military applications.

Q 69.A

- The gravitational force between two bodies is directly proportionate to the product of masses of the two objects and inversely proportionate to the square of the distance between them.
- The electromagnetic force between two bodies is directly proportionate to the product of charges of the two objects and inversely proportionate to the square of the distance between them. **Hence statement 3 is not correct.**
- Gravitational force is always attractive while Electromagnetic force can be both attractive and repulsive. The same charges repel each other while opposite charges attract. **Hence statement 1 is correct**
- The electromagnetic force is not dependent upon mass. **Hence statement 2 is not correct**.

Q 70.D

- **Statement 1 is correct:** Golden rice is a variety of rice (Oryza sativa) **produced through genetic engineering to biosynthesize beta-carotene, a precursor of vitamin A,** in the edible parts of rice. **It is intended to produce a fortified food to be grown and consumed in areas with a shortage of dietary vitamin A.**
- **Statement 2 is correct:** Golden Rice technology is based on the simple principle that rice plants possess the whole machinery to synthesise β-carotene, and while this machinery is fully active in leaves, parts of it are turned off in the grain. By adding only two genes, **a plant phytoene synthase (psy) and a soil bacterial phytoene desaturase (crt I),** the pathway is turned back on and β-carotene consequently accumulates in the grain.
- **Statement 3 is not correct:** It wouldn't suffice to merely introduce one Golden Rice variety onto the market. Vital is that sufficient crop diversity prevails and that varieties are adapted to cultural traditions and are suitable for local cultivation conditions. **The Golden Rice trait is therefore crossed in as many varieties as possible. Once on the market conventional breeding work shall continue** and new varieties with the trait can be continually added. In several countries, **golden rice has been bred with local rice cultivars.** Golden rice has not yet been grown commercially, and backcrossing is still ongoing in current varieties to reduce yield drag .

Q 71.C

- Nucleic acid, naturally occurring chemical compound that is capable of being broken down to yield phosphoric acid, sugars, and a mixture of organic bases (purines and pyrimidines). Nucleic acids are the main information-carrying molecules of the cell, and, by directing the process of protein synthesis, they determine the inherited characteristics of every living thing.
- The two main classes of nucleic acids are deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). DNA is the master blueprint for life and constitutes the genetic material in all free-living organisms and most viruses. RNA is the genetic material of certain viruses, but it is also found in all living cells, where it plays an important role in certain processes such as the making of proteins.
- **Each nucleotide has three components: a 5-carbon sugar, a phosphate group, and a nitrogenous base.**
- **The DNA does not include a potassium base and hence only option 4 is not correct.**

Q 72.D

- Oxalic acid is used in the bleaching of leather, removal of ink, photography, clothing printing. **Hence pair 1 is correctly matched.**

Join Telegram- https://t.me/upsc_success_time1

- Acetic Acid is used as a solvent, in preparation of vinegar, acetone, and processing of food. **Hence pair 2 is correctly matched.**
- Citric Acid is used in washing metals, processing of food and drugs, in the cloth industry. **Hence pair 3 is correctly matched.**
- Benzoic Acid is used for the preservation of medicine and food. **Hence pair 4 is not correctly matched.**
- Sulphuric Acid is used in accumulation batteries.

Q 73.A

- **A gene is the basic physical and functional unit of heredity.** Genes, which are made up of DNA, act as instructions to make molecules called proteins. In humans, genes vary in size from a few hundred DNA bases to more than 2 million bases. Every person has two copies of each gene, one inherited from each parent.
- Most genes are the same in all people, but a small number of genes (less than 1 percent of the total) are slightly different between people. Alleles are forms of the same gene with small differences in their sequence of DNA bases. These small differences contribute to each person's unique physical features.
- **Hence option (a) is the correct answer.**

Q 74.C

- **Your blood group is determined by the genes you inherit from your parents. Each group can be either RhD positive or RhD negative, which means in total there are 8 blood groups.**
- There are 4 main blood groups defined by the ABO system:
  - blood group A – has A antigens on the red blood cells with anti-B antibodies in the plasma
  - blood group B – has B antigens with anti-A antibodies in the plasma
  - blood group O – has no antigens, but both anti-A and anti-B antibodies in the plasma
  - blood group AB – has both A and B antigens, but no antibodies
- Receiving blood from the wrong ABO group can be life-threatening. For example, if someone with group B blood is given group A blood, their anti-A antibodies will attack the group A cells. This is why group A blood must never be given to someone who has group B blood and vice versa. As group O red blood cells do not have any A or B antigens, it can safely be given to any other group.
- **The correct answer is the option (c).**

Parent 1	Parent 2	Baby's possible blood types
A	A	A, O
A	B	A, B, AB, O
A	AB	A, B, AB
A	O	A, O
B	B	B, O
B	AB	A, B, AB
B	O	B, O
AB	AB	A, B, AB
AB	O	A, B
O	O	O

Q 75.B

- Bacteria like Streptococcus **pneumoniae** and Haemophilus influenza are responsible for the disease pneumonia in humans which infects the alveoli (air filled sacs) of the lungs. As a result of the infection, the alveoli get filled with fluid leading to severe problems in respiration. The symptoms of pneumonia include fever, chills, cough and headache. Dysentery, plague, **diphtheria**, etc., are some of the other bacterial diseases in man.
- Many viruses also cause diseases in human beings. Rhino viruses represent one such group of viruses which cause one of the most infectious human ailments – the common cold. They infect the nose and respiratory passage but not the lungs. Similarly **Measles** is a highly contagious infectious disease caused by the **measles** virus. Symptoms usually develop 10–12 days after exposure to an infected person and last 7–10 days. Initial symptoms typically include fever, often greater than 40 °C (104.0 °F), cough, runny nose, and inflamed eyes.
- Some of the human diseases are caused by protozoans too. For example, **malaria**, a disease man has been fighting since many years. Plasmodium, a tiny protozoan is responsible for this disease. Different species

Join Telegram- https://t.me/upsc_success_time1

of Plasmodium (P. vivax, P. malaria and P. falciparum) are responsible for different types of malaria. Of these, malignant malaria caused by Plasmodium falciparum is the most serious one and can even be fatal.

- **Hence option (b) is the correct answer.**

Q 76.D

- **Sulfur mustard**, commonly known as mustard gas, is a chemical warfare agent with the ability to form large blisters on exposed skin and in the lungs. Mustard gas was used to lethal effect during World War I.
- **Sarin** is a colorless, odorless liquid used as a chemical weapon owing to its extreme potency as a nerve agent. It is generally considered a weapon of mass destruction. As a nerve gas, sarin in its purest form is estimated to be 26 times more deadly than cyanide.
- **Phosgene** is the chemical compound with the formula $COCl_2$. It was used as a chemical weapon during World War I where it was responsible for about 85% of the 100,000 deaths caused by chemical weapons. It is also a valued industrial reagent and building block in synthesis of pharmaceuticals and other organic compounds.
- **Hence option (d) is the correct answer.**

Q 77.C

- **Vela is the fourth submarine of P75 of the Indian Navy. Hence statement 1 is correct.**
- Other three are **INS Kalvari, INS Khanderi and INS Karanj.** Sea trials are ongoing for **Vagir**, while the sixth, **Vagsheer**, is under construction.
- Vela is named after a decommissioned submarine Vela, which served the Navy from 1973 to 2010. The earlier Vela belonged to the Foxtrot class submarine of Soviet origin.
- P 75 evolved into a 30-year plan for building submarines. **In 2005, India and France signed a $ 3.75 billion contract for building six Scorpene-class submarines.**
- The submarine is equipped with a C303 anti-torpedo countermeasure system and can carry up to 18 torpedoes or Exocet anti-ship missiles or 30 mines in place of torpedoes.
- **Vela is a diesel-electric powered attack submarine**, designed to act as "sea denial" as well as "access denial" warfare to the adversary. It has a **silent Permanently Magnetised Propulsion Motor. Hence statement 2 is correct.**

Q 78.C

- **Recently, Israeli Prime Minister Naftali Bennett recently said the country intends to double the number of settlers living in the Israeli-controlled Golan Heights with a multimillion-dollar plan meant to further consolidate Israel's hold on the territory.**
- **The Golan Heights is a rocky plateau with an area of 1,800km² on the border between Israel and Syria in south-western Syria.**
- The Golan Heights were captured by Israel from Syria in the 1967 conflict and annexed in 1981 — a move not recognized internationally.
- **Geographic features - The area is bounded by the Jordan River and the Sea of Galilee on the west, Mount Hermon on the north, and Yarmouk River on the east and south**
- **Hence option (c) is the correct answer.**

Join Telegram- https://t.me/upsc_success_time1

Q 79.C

- **Option 1 is not correct: Melting of ice is a physical change** because it involves change only in the physical state of water. Ice in solid state convert to water in the liquid state. Moreover, no new chemical substance is formed in the process and this change is reversible.
- **Option 2 is correct:** Vinegar is an aqueous solution of acetic acid and trace chemicals that may include flavourings. Vinegar typically contains 5–20% by volume acetic acid. Usually, the acetic acid is produced by the fermentation of ethanol or sugars by acetic acid bacteria. **Fermentation is the chemical breakdown** of a substance by bacteria, yeasts, or other microorganisms.
- **Option 3 is not correct:** If the chemical formulas do not change, then any changes are physical changes. **An example of physical is dissolving sugar in water**. Once the sugar has all dissolved, you have molecules of sugar mixed in with the molecules of water. The chemical formulas at the end are the same as they were at the start, so this is a physical change.

Q 80.C

- Malleability is a physical property of metals that defines the ability to be hammered, pressed or rolled into thin sheets without breaking. In other words, it is the property of a metal to deform under compression into a different form. A metal's malleability can be measured by how much pressure (compressive stress) it can withstand without breaking. Differences in malleability among different metals are due to variances in their crystal structures. **Hence statement 1 is correct.**
- Gold is the most malleable of all metals; a single gram can be beaten into a sheet of 1 square meter, a Gold leaf can be beaten thin enough to become semi-transparent. **Hence statement 2 is correct.**

Q 81.C

- Enzymes can break down nutrients into small, soluble molecules that can be absorbed.

Enzyme	**Substrate**	**End-products**	**Where produced**
Salivary amylase	Starch	Maltose	Salivary glands
Protease	Protein	Amino acids	Stomach, pancreas
Lipase	Lipids (fats and oils)	Fatty acids and glycerol	Pancreas
Pancreatic amylase	Starch	Maltose	Pancreas
Maltase	Maltose	Glucose	Small intestine

- **Saliva contains the digestive enzyme salivary amylase. Salivary amylase helps in the predigestion of starch, hydrolysing it into maltose and dextrin.**
- Bile helps in emulsification of fats, i.e., breaking down of the fats into very small micelles.
- **Hence option (c) is the correct answer.**

Q 82.B

- The **Deep Web (also known as the undernet, invisible Web and hidden Web, among other monikers) consists of data that you won't locate with a simple Google search.** The deep web, invisible web, or hidden web are parts of the World Wide Web whose contents are not indexed by standard web search engines. The opposite term to the deep web is the "surface web", which is accessible to anyone/everyone using the Internet. The so-called surface Web, which all of us use routinely, consists of data that search engines can find and then offer up in response to your queries. But in the same way that only the tip of an iceberg is visible to observers, a traditional search engine sees only a small amount of the information that's available -- a measly 0.03 percent. **Hence option (b) is the correct answer.**
- **Dark Web:** The Dark Web allows users to remain anonymous through encryption. This is attractive to anyone involved in illegal activity, such as child pornography, sex trafficking, illicit drugs, or counterfeit goods. But it also may be useful for anyone living in an authoritarian state wishing to communicate with the outside world, as well as providing a safe space for whistleblowers. So while it's not illegal to visit the Dark Web, it provides access to illegal activities.

Q 83.C

- Antihistamines : They are used to relieve itch, redness and swelling in some skin conditions and other types of allergy. They also help to relieve some of the symptoms of the common flu and hay fever, like sneezing, runny nose and watery eyes. They work by cancelling the effects of histamine produced by the body in allergic conditions. **Hence pair 1 is not correctly matched.**
- Tranquilizers: They are a class of chemical compounds used for the treatment of stress and mild or even severe mental diseases. These relieve anxiety, stress, irritability or excitement by inducing a sense of well-being. They form an essential component of sleeping pills. **Hence pair 2 is correctly matched.**

Join Telegram- https://t.me/upsc_success_time1

- Analgesics : It reduces or abolishes pain without causing impairment of consciousness, mental confusion, incoordination or paralysis or some other disturbances of the nervous system. **Hence pair 3 is correctly matched.**

Q 84.C

- If a cup with a hole in the bottom is taken and honey is poured into it, it is found that the cup drains very slowly. If the same cup is filled with water, the cup drains much more quickly. This is because **honey's viscosity is large compared to water's viscosity.**
- Viscosity is a measure of a fluid's resistance to flow. It describes the internal friction of a moving fluid. A fluid with large viscosity resists motion because its molecular makeup gives it a lot of internal friction. A fluid with low viscosity flows easily because its molecular makeup results in very little friction when it is in motion.
- **Hence option (c) is the correct answer.**

Q 85.A

- Circulatory system diseases cover a vast array of different abnormalities and disorders that affect the way the body circulates blood. Circulatory system disorders can lead to decreased perfusion of blood throughout the body, threatening the healthy function of tissue and organs.
- **Option 1 is correct.** High blood pressure: Also going by the term hypertension, this is a condition that is defined by the increased force required to pump blood through your arteries.
- **Option 2 is not correct**. Parkinson's disease affects the nerve cells in the brain that produce dopamine. Parkinson's disease symptoms include muscle rigidity, tremors, and changes in speech and gait.
- **Option 3 is not correct**. Epilepsy is a chronic disorder that causes unprovoked, recurrent seizures. A seizure is a sudden rush of electrical activity in the brain.

Q 86.B

- The Central Nervous System includes the brain and the spinal cord and is the site of information processing and control. The Peripheral Nervous System comprises of all the nerves of the body associated with the CNS (brain and spinal cord). The brain is the central information processing organ of our body, and acts as the 'command and control system'. It controls the voluntary movements, balance of the body, functioning of vital involuntary organs (e.g., lungs, heart, kidneys, etc.), thermoregulation, hunger and thirst, circadian (24-hour) rhythms of our body, activities of several endocrine glands and human behaviour. It is also the site for processing of vision, hearing, speech, memory, intelligence, emotions and thoughts.
- **The hypothalamus is a small region of the brain. It's located at the base of the brain, near the pituitary gland. It synthesizes and secretes neurohormones, often called hypothalamic-releasing hormones. These hypothalamic releasing hormones control and regulate the secretion of pituitary hormones**.
- **Functions of the hypothalamus can be listed as:**
  - controls the release of 8 major hormones by the pituitary gland
  - controls body temperature
  - control of food and water intake, hunger and thirst
  - control of sexual behavior and reproduction
  - control of daily cycles in physiological state and behaviour also known as circadian rhythm
  - mediation of emotional responses

Q 87.A

- Prebiotics are a group of nutrients that are degraded by gut microbiota.
- Prebiotics are non-digestible substances, found in fiber. They serve as food for probiotic bacteria and stimulate their growth in the large intestine.
- They pass through the small intestine only partially digested, and so once they reach the colon, they are able to be fermented by the bacteria there.
- **Hence option (a) is the correct answer.**

Q 88.D

- A major characteristic of an atom is its **atomic number**, which is defined as the number of protons. The chemical properties of an atom are determined by its atomic number. The total number of nucleons (protons and neutrons) in an atom is the atomic **mass number**. Atoms with the same atomic number but

Join Telegram- https://t.me/upsc_success_time1

with different atomic masses are called **isotopes**. Isotopes have identical chemical properties, yet have very different nuclear properties. For example, there are three isotopes of hydrogen. Two of these isotopes are stable (not radioactive), but tritium (one proton and two neutrons) is unstable. Most elements have stable isotopes.

- **Radioactive isotopes** can also be created for many elements. An isotope of uranium (Uranium-235) is used as a **fuel in nuclear reactors**. An isotope of cobalt (Cobalt-60) is used in the **treatment of cancer**. An isotope of iodine (Iodine-131) is used in the **treatment of goitre.**

Q 89.A

- Exposure to any type of ionizing radiation (a and b particles, g-rays and X-rays) can prove harmful and even lethal. The two types of effects are : **(i) genetic and (ii) nongenetic or body damage.**
- **In genetic damage, genes and chromosomes get altered.** Its effect may become visible as deformations in the offsprings (children or grandchildren). Alterations or breaks in the genetic material, that is DNA (deoxyribonucleic acid)- the molecule containing genetic information, is called mutation.
- **In nongenetic effects, the harm is visible immediately in the form of birth defects, burns, some type of leukemia, miscarriages, tumors, cancer of one or more organs and fertility problems.**
- Types of Ionizing Radiation
- **Alpha particles (α) are positively charged and made up of two protons and two neutrons from the atom's nucleus. Alpha particles come from the decay of the heaviest radioactive elements, such as uranium, radium and polonium. Hence statement 1 is not correct.**
- The health effect from exposure to alpha particles depends greatly on how a person is exposed. **Alpha particles lack the energy to penetrate even the outer layer of skin,** so exposure to the outside of the body is not a major concern.
- Inside the body, however, they can be very harmful. If alpha-emitters are inhaled, swallowed, or get into the body through a cut, the alpha particles can damage sensitive living tissue.
- **Beta particles (β) are small, fast-moving particles with a negative electrical charge that are emitted from an atom's nucleus during radioactive decay. Hence statement 2 is not correct.**
- These particles are emitted by certain unstable atoms such as hydrogen-3 (tritium), carbon-14 and strontium-90.
- Beta particles are more penetrating than alpha particles, but are less damaging to living tissue and DNA because the ionizations they produce are more widely spaced.
- **Gamma rays (γ) are weightless packets of energy called photons**. Unlike alpha and beta particles, which have both energy and mass, gamma rays are pure energy. They Can easily penetrate the body and pass through it. **They cause damage to cell structure. Hence statement 3 is correct.**
- X-rays are similar to gamma rays in that they are photons of pure energy. **X-rays and gamma rays have the same basic properties but come from different parts of the atom.**
- X-rays are emitted from processes outside the nucleus, but gamma rays originate inside the nucleus. They also are generally lower in energy and, therefore less penetrating than gamma rays. X-rays can be produced naturally or by machines using electricity.

Q 90.D

- The **kidneys** are two bean-shaped organs that **extract waste from blood**, balance **body** fluids, form urine, and aid in other important functions of the body.
- Other than the kidneys, lungs, liver and skin also help in the elimination of excretory wastes. Our lungs remove large amounts of CO2 (approximately 200mL/ minute) and also significant quantities of water every day.
- **Liver,** the largest gland in our body, secretes bile-containing substances like bilirubin, biliverdin, cholesterol, degraded steroid hormones, vitamins and drugs. Most of these substances ultimately pass out alongwith digestive wastes.
- The **sweat and sebaceous glands in the skin** can eliminate certain substances through their secretions. Sweat produced by the sweat glands is a watery fluid containing NaCl, small amounts of urea, lactic acid, etc. Though the primary function of sweat is to facilitate a cooling effect on the body surface, it also helps in the removal of some of the wastes mentioned above.
- **Sebaceous glands** eliminate certain substances like sterols, hydrocarbons and waxes through sebum. This secretion provides a protective oily covering for the skin.
- **Hence option (d) is the correct answer.**

Join Telegram- https://t.me/upsc_success_time1

Q 91.B

- Left Ventricle of the heart supplies the oxygenated blood through the pulmonary veins throughout the body. **Hence options 2 and 3 are correct.**
- Pulmonary arteries carries the deoxygenated blood from heart to the lungs for purification. **Hence option 1 is not correct.**
- The heart is a muscular organ about the size of a closed fist that functions as the body's circulatory pump. It takes in deoxygenated blood through the veins and delivers it to the lungs for oxygenation before pumping it into the various arteries
- The heart contains 4 chambers: the right atrium, left atrium, right ventricle, and left ventricle. The atria are smaller than the ventricles and have thinner, less muscular walls than the ventricles. The atria act as receiving chambers for blood, so they are connected to the veins that carry blood to the heart. The ventricles are the larger, stronger pumping chambers that send blood out of the heart. The ventricles are connected to the arteries that carry blood away from the heart.
- The chambers on the right side of the heart are smaller and have less myocardium in their heart wall when compared to the left side of the heart. This difference in size between the sides of the heart is related to their functions and the size of the 2 circulatory loops. The right side of the heart maintains pulmonary circulation to the nearby lungs while the left side of the heart pumps blood all the way to the extremities of the body in the systemic circulatory loop

Q 92.D

- Acid-Base indicators (also known as pH indicators) are substances which change colour with pH value. They are usually weak acids or bases, which when dissolved in water dissociate slightly and form ions.
- Substances which show the acidic or basic behavior of other substance by a change in colour and other properties is known as indicator.
- There are many types of indicators. Some common types of indicators are
  - **Natural** - Indicators obtained from natural sources are called natural indicators. Litmus, turmeric, **red cabbage**, China rose, etc. are some common natural indicators used widely to show the acidic or basic character of substances.
  - **Olfactory Indicator** - Substances which change their smell when mixed with acid or base are known as olfactory indicators. For example **onion**, vanilla, clove, etc.
  - **Synthetic Indicator** - Indicators that are synthesized in the laboratory are known as synthetic indicators. For example; **phenolphthalein**, methyl orange, etc.
  - **Universal Indicator** - Universal indicator is the combination of many indicators, such as water, propanol, phenolphthalein, sodium salt, sodium hydroxide, methyl red, bromothymol blue monosodium salt, and thymol blue monosodium salt. A universal indicator shows a different colour over the range of pH value from 1 to 14 for a given solution. Universal indicator is available both in the form of strips and solution.

Q 93.B

- Food fortification or enrichment is the process of adding micronutrients (essential trace elements and vitamins) to food. It can be carried out by food manufacturers, or by governments as a public health policy that aims to reduce the number of people with dietary deficiencies within a population.
- Double Fortified Salt is formed by blending iron premix with iodized salt.
- It is one of the most cost-effective opportunities to deliver two of the most critical micronutrients for mental capacity, maternal and infant survival, and human productivity. Salt double-fortified with **iron as well as iodine** has created an exciting new opportunity to reach the world with supplemental iron easily and inexpensively.
- **Hence only options 1 and 2 are correct.**

Q 94.D

- Epigenetics is the study of heritable changes in gene expression that do not involve changes to the underlying DNA sequence - a change in phenotype without a change in genotype - which in turn affects how cells read the genes. Epigenetic change is a regular and natural occurrence but can also be influenced by several factors including age, the environment/lifestyle, and disease state.
- Epigenetic modifications can manifest as commonly as the manner in which cells terminally differentiate to end up as skin cells, liver cells, brain cells, etc. Or, epigenetic change can have more damaging effects that can result in diseases like cancer.
- New and ongoing research is continuously uncovering the role of epigenetics in a variety of human disorders and fatal diseases.
- **Hence, option (d) is the correct answer.**

Join Telegram- https://t.me/upsc_success_time1

Q 95.A

- A stem cell is essentially the building block of the human body. **Stem cells are capable of dividing for long periods of time, are unspecialized, but can develop into specialized cells.**
- The earliest stem cells in the human body are those found in the human embryo. The stem cells inside an embryo will eventually give rise to every cell, tissue and organ in the fetus's body.
- Unlike a regular cell, which can only replicate to create more of its own kind of cell, a stem cell is pluripotent. When it divides, it can make any one of the 220 different cells in the human body. Stem cells also have the capability to self-renew -- they can reproduce themselves many times over.
- However stems cells are not only found in human embryo. **Hematopoietic stem cells are a type of adult stem cell found in bone marrow of an adult human being.** They make new red blood cells, white blood cells, and other types of blood cells. Doctors have been performing stem cell transplants, also known as bone marrow transplants, for decades using hematopoietic stem cells in order to treat certain types of cancer.
- **Hence option (a) is the correct answer.**

Q 96.A

- **MRI scanning does not use X rays. X-ray scanning uses ionizing radiations to excite electrons in the atoms. MRI does not use ionizing radiations**. Instead, while in the magnet, radio waves redirect the alignment of hydrogen atoms that naturally exist within the body without causing any chemical changes in the tissues. As the hydrogen atoms return to their usual alignment, they emit energy that varies according to the type of body tissue in which they lie. **Hence statement 1 is not correct.**
- **MRI can be used to produce pictures of internal organs and soft tissues including bone. But it is more useful in soft tissue evaluation. Computerized Tomography (CT scan) is suited for bone imaging**, lung and chest imaging, cancer detection. **Hence statement 2 is not correct.**
- Jewelry and other wearable metallic accessories are not allowed during MRI since it interferes with the magnetic field. **Hence statement 3 is correct.**

Q 97.B

- **White space**, in a communications context, **refers to underutilized portions of the radio frequency (RF) spectrum.** The switchover to digital television left large portions of the spectrum unused, in particular the frequencies allocated for analog television and those used as buffers to prevent interference between channels.
- So White-Fi is the **use of frequencies made available by the absence of analog-to-air TV signals to create Wi-Fi networks.** The technology is specified in the **IEEE (Institute of Electrical and Electronics Engineers) 802.11af standards. Hence option (b) is the correct answer.**
- White space Wi-Fi will require new hardware but offers improvements in range, speed and penetration of obstacles that could lead to better quality service at a lower cost.
- White-Fi requires fewer network devices to cover an area. It is important for businesses that provide large Wi-Fi networks.

Q 98.A

- **Totipotency is the ability of a single cell to divide and produce all of the differentiated cells in an organism**. It was learned by scientists, during the 1950s, that whole plants could be regenerated from explants, i.e., any part of a plant taken out and grown in a test tube, under sterile conditions in special nutrient media. This capacity to generate a whole plant from any cell/explant is called totipotency.
- Totipotency is set to become a key tool for research and future medical applications. Human development begins when a sperm fertilizes an egg and the resulting fertilized egg creates **a single totipotent cell, a zygote.** The zygote divides numerous times and forms cells that are the precursors to the trillions of cells that will eventually constitute the human body
- Finding efficient ways to generate totipotent-like cells is therefore crucial. Totipotent cells own the highest differentiation potential of all cells. They can only be found shortly after fertilization in an early embryonic state and are capable of producing all cell types. Pluripotent cells, also called embryonic stem cells, on the contrary, have lost some of this potential as they have already further developed.
- **Hence option (a) is the correct answer.**

Join Telegram- https://t.me/upsc_success_time1

Q 99.D

- **Washing soda (**$Na_2CO_3.10H_2O$) is obtained from sodium chloride (NaCl). **Hence statement 1 is correct.**
- **Uses of washing soda:**
  - Sodium carbonate (washing soda) is used in glass, soap and paper industries.
  - It is used in the manufacture of sodium compounds such as borax.
  - Sodium carbonate can be used as a cleaning agent for domestic purposes. **Hence statement 2 is correct.**
  - It is used for removing the permanent hardness of the water. **Hence statement 3 is correct.**

Q 100.D

- **Statement 1 is not correct:** A nanomaterial is an object which has at least one dimension in the nanometer scale (1-100 nm).
- **Statement 2 is not correct:** Nanoparticles are not solely a product of modern technology but are also created by natural processes such as volcano eruptions or forest fires. Naturally occurring nanoparticles also include ultrafine sand grains of mineral origin (e.g. oxides, carbonates). In addition to commercially produced nanoparticles, many are unintentionally created by the combustion of diesel fuel (ultrafine particles) or during barbecuing. Synthetic nanoparticles find use in many applications. This includes dispersions in gases (e.g. as aerosols), as ultrafine powder, for films, distributed in fluids (dispersed, for example, ferrofluids) or embedded in a solid body (nanocomposites).

Copyright © by Vision IAS
All rights are reserved. No part of this document may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission of Vision IAS.

Join Telegram- https://t.me/upsc_success_time1

Join Telegram- https://t.me/upsc_success_time1

Join Telegram- https://t.me/upsc_success_time1